AMERICAN ARTISAN

WARM AIR HEATING • AIR CONDITIONING
SHEET METAL CONTRACTING

AIR CONDITIONING SECTION
PAGE 43

ESTABLISHED 1880

NOVEMBER 1938

You're Safe when you install LAMNECK PREFABRICATED DUCT

Safe on Quality, Service, Competition and Profit

● Whether it's Prefabricated Duct or Gravity Pipe and Fittings *you're safe* when you install Lamneck.

You're safe on quality because for 21 years Lamneck has set the standard of quality in Furnace Pipe, Fittings and Registers for Gravity Warm Air Heating Systems. In Prefabricated Duct, Lamneck for four years has held the lead for quality through advanced engineering practice and modern design and workmanship.

You're safe on service because Lamneck has developed a complete series of new and practical service features which give invaluable aid to dealers, jobbers and manufacturers in the sale and installation of Lamneck Prefabricated Duct and Gravity Pipe, Fittings and Registers.

You're safe against competition because Lamneck products, with their outstanding efficiency, flexibility and economy, insure customer satisfaction and good will. Quality combined with low price of parts and low cost of installation makes an unbeatable set-up against competition.

You're safe on your profits because with the Lamneck Simplified System you can determine your profits accurately beforehand and avoid the uncertainties and losses which frequently attend the old-fashioned method of making your own duct and fittings.

Wide availability of Jobber Stocks in all Parts of the Country Insure Prompt Delivery. Write for Name of Jobber in Your Locality.

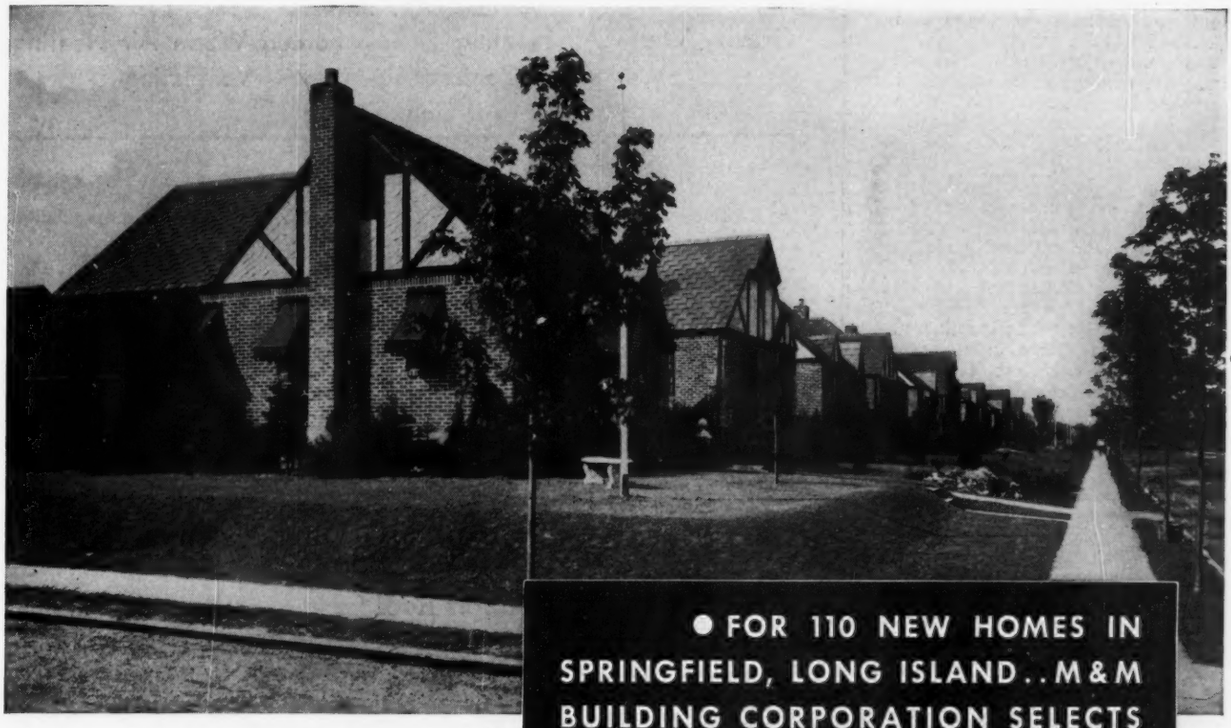
LEADERS FOR 21 YEARS IN FURNACE PIPE, FITTINGS AND REGISTERS
LEADERS FOR 4 YEARS IN PREFABRICATED DUCT

LP INC

LAMNECK PRODUCTS, INC.
414 DUBLIN AVENUE • COLUMBUS, OHIO

PREFABRICATED DUCT AND FITTINGS FOR ALL TYPES OF WARM AIR HEATING AND AIR CONDITIONING SYSTEMS

THOSE WHO MUST SELL WHAT THEY BUILD SELECT ANTHRACITE FOR HEATING



● FOR 110 NEW HOMES IN SPRINGFIELD, LONG ISLAND..M&M BUILDING CORPORATION SELECTS ANTHRACITE HEATING EQUIPMENT

THE WISE heating contractor knows that year after year heating cost is even more important to the home owner than original equipment cost.

More and more, such heating contractors are recommending Anthracite for fuel, because they find that modern Anthracite heating is so satisfying to the home owner, and fuel bills are so easy on the pocketbook, that extra good-will for the heating contractor is bound to follow.

The builder of the above illustrated homes says: "My experience in building this type of home definitely shows that it is cheaper to heat them with Anthracite than it is to heat them with oil."

Anthracite is the one fuel which will provide this economy without sacrificing comfort and convenience.

The book, "Modern Anthracite Equipment," describes the newest developments in automatic heat and air conditioning. A copy will be sent upon request.

ANTHRACITE INDUSTRIES, INC.
Chrysler Building, New York

ANTHRACITE INDUSTRIES INCORPORATED approved

This Seal of Approval appears on Anthracite equipment only after it has passed the most rigid tests in the heating field.

Pennsylvania
ANTHRACITE
COAL

***THE* MODERN FUEL FOR SOLID COMFORT**

In This Issue

THIS month's cover, supplementing the illustrations with the article on page 36, shows mechanics applying porcelain enameled steel sheets to the exterior of a one-story building. This field, according to reports from the east and verified from the South and Southwest, is expanding rapidly. Where union jurisdiction does not interfere, this application of metal ought to be an active field for the sheet metal contractor. Photo by Ferro Enamel Co., Cleveland.

★

The metal-lined powdered milk silo on page 26 presents methods for laying floors and walls which have far wider applications than this one particular structure. As the article reports, the methods now adopted are the result of several years' experimentation, during which likely ideas were discarded because service disclosed weaknesses.

★

During the course of any one year, readers frequently ask for patterns for pipes which cut through pitched roofs. On page 32 William Neubecker describes a short cut method for determining the miter cut using a pan of water and a common level.

★

With the Wage-Hours law now furnishing new cause for loss of sleep, Arnold Kruckman (page 39), from Washington, summarizes the law and points out how broad is the application. We suggest that if you doubt your liability under this law, you read this report of recent rulings to find, as we did, that most every firm is liable..

★

Once more we begin publication of an existing heating ordinance. The code of Salem, Oregon, has been in force for several years and, according to reports, has been beneficial. See page 67.

★

We believe that the report from the Research Residence given at last January's ASHVE meeting covering methods for reducing floor-ceiling temperature differences, eliminating cold floors during off-cycles of the fan and advantages of two-speed blower operation is one of the most valuable reports yet rendered by the Residence staff. Part 3 appears on page 45.

★

Two job descriptions in this issue should be interesting. The first (page 49) explains the engineering design of a system installed under the Minneapolis code. The other, page 54, reports fuel costs of a warm floor plenum system as compared to an identical house heated by "spot" air distribution.

AMERICAN ARTISAN

With which is merged

FURNACES AND SHEET METALS AND Warm-Air Heating

Covering All Activities in

Gravity Warm Air Heating — Forced Warm Air Heating
Sheet Metal Contracting — Ventilating
Air Conditioning

J. D. Wilder, Editor

A. A. Kennedy, Assistant Editor — Brewster S. Beach, Consulting Editor

Vol. 107, No. 11 — November, 1938 — Founded 1880

CONTENTS

Merrily We Roll Along 25
Powdered Milk Silo with Metal Floor and Wall 26
Designing an Ear Seed Corn Drier (Part 3) 29
Heating Costs for Temperatures Above 70° 31
Pattern for Shanty Top or Roof Jack 32
The Problem Corner 34
Porcelain Enameled Steel 36
Arnold Kruckman's Washington Letter 39
Silver Soldering Copper Plate Vessels 40
Lint Collector for a Mattress Factory 42
Heating Ordinance of Salem, Oregon 67
Association Activities 69
New Products 70
News Items 81
With the Manufacturers 84
New Literature 88

THE AIR CONDITIONING SECTION

Reducing Floor-Ceiling Temperature Differences 45
System Designed to the Minneapolis Code 49
Infiltration Losses and Furnace Capacity 52
ASTM Revised Specifications for Fuel Oil 53
Fuel Costs for a Warm Floor Plenum System 54
Characteristics of Air Borne Particles 57
Heat Conservation in Gas Heated Buildings 62

Member of Audit Bureau of Circulations—Member Associated Business Papers, Inc.

Published monthly by Keeney Publishing Company, 6 North Michigan Ave., Chicago. Branch Offices—In New York, Room 1784, Grand Central Terminal Building, Murray Hill 2-8293; In Cleveland, 2128 Rossmoor Road, Cleveland Heights, Yellowstone 1540; In Los Angeles, J. H. Tinkham, 1406 S. Grand Ave., Richmond 6191.

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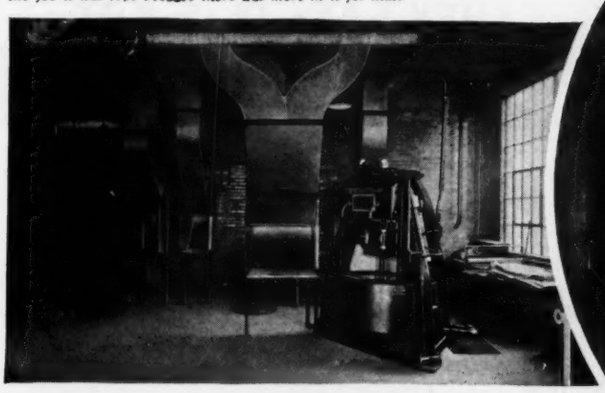
Yearly Subscription Price—U. S. and possessions, Canada, Mexico, South America, Central America, $2.00; Foreign, $4.00. Single copies, U. S. and possessions, $.25. Back numbers, $.50. January, 1938, Directory issue, $1.00 per copy. Entered as second-class matter, July 29, 1932, at the post office at Chicago, Illinois, under the act of March 3, 1879.

More than 8,000 Copies of this Issue are being distributed

As long as laundries care for CLOTHES *—and* COSTS!

Monel Chutes. *This chute job would be a good one to get in any material—but in Monel it's tops. The customer will not need repairs or replacements for years to come. For the sheet metal worker who did the job it was tops because there was more in it for him.*



Monel Starch Cookers. *These two were supplied to a prominent laundry on the Pacific Coast. Monel in no way harmfully contaminates the starch. Made of light gauge Monel sheet and equipped with Monel covers and Monel piping.*

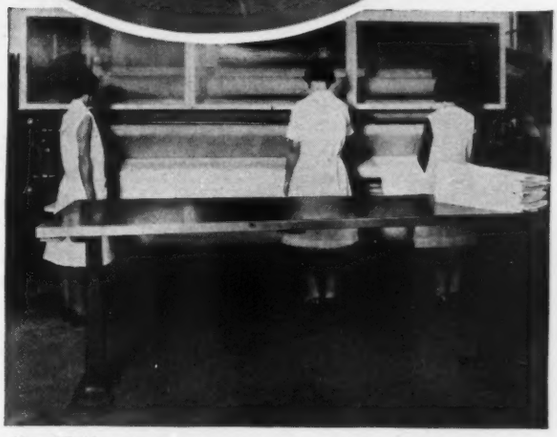
. . . they need these five jobs that YOU can DO

HOW long since you've made the rounds of the laundries near you? Right on this page are 5 good reasons why you shouldn't wait any longer.

Every job here made profits for some sheet metal man who knows his Monel.* They're all items the laundry uses . . . and Johnny-on-the-spot usually lands them.

Remember, the laundries KNOW Monel . . . you don't have much explaining to do. They've used it for years in their washers: they know it can't rust, and resists corrosion. They know it's strong and tough and long-lived.

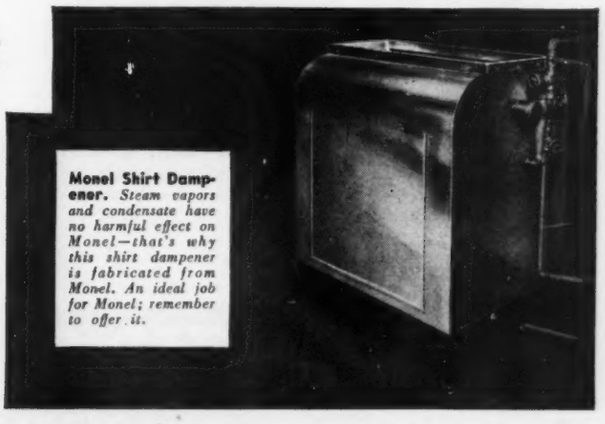
So about all you have to convince them is that you're the chap who knows how to fabricate Monel. Write us to-day if you need information on forms and sizes available and prices. Then take this page along and start out to make calls: you'll find them profitable calls.



Monel Tables. *One of the outstanding sheet metal applications for Monel in the laundry. Using moderately light gauge Monel sheet, tables can be covered at economical cost. Monel-topped tables appeal to laundry operators as they are proof against rust and splinters; they are easily cleaned, attractive and durable.*

THE INTERNATIONAL NICKEL COMPANY, INC.
67 WALL STREET NEW YORK, N. Y.

Monel Plant Trucks. *Practically every laundry uses plant trucks (usually about 24"x36"x24" deep) to transfer the cleaned wet garments from the washers to extractors and then to drying tumblers. Easily fabricated from light gauge Monel sheet .028" and .031" thick.*



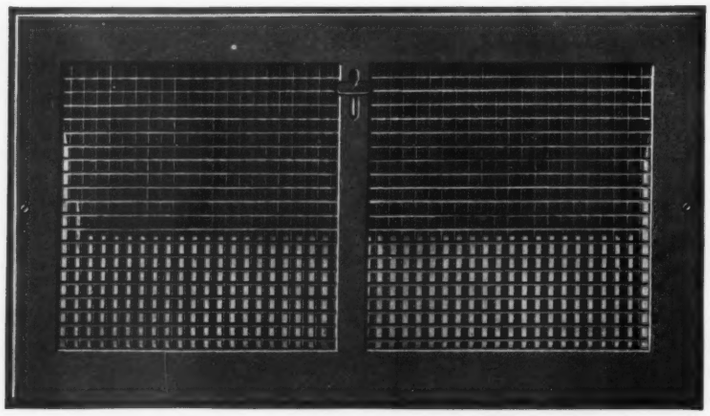
Monel Shirt Dampener. *Steam vapors and condensate have no harmful effect on Monel—that's why this shirt dampener is fabricated from Monel. An ideal job for Monel; remember to offer it.*

MONEL

*Monel is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. This alloy is mined, smelted, refined, rolled and marketed solely by International Nickel.

JOIN the ARMY of Successful Heating Contractors

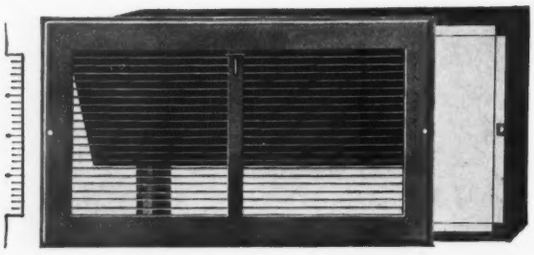
who do not order the "Cheapest" but select the SAFER LINES of U. S. AIR-CONDITIONING REGISTERS that PREVENT CLOUDED CEILINGS and SIDEWALLS.



THEY SAY—IT IS NOT GOOD BUSINESS . . .

to install a cheap non-directional Flow Air-Conditioning Register on a High Grade HEATING system—WHEN for but a FEW CENTS MORE Per REGISTER you can eventually SAVE your CUSTOMER VAST SUMS of Redecorating Expense.

U. S. LOUVER-TYPE and ADJUSTABLE-BAR REGISTERS render that SAVING—with Added Side-Flow Features of INSET-PANELS.

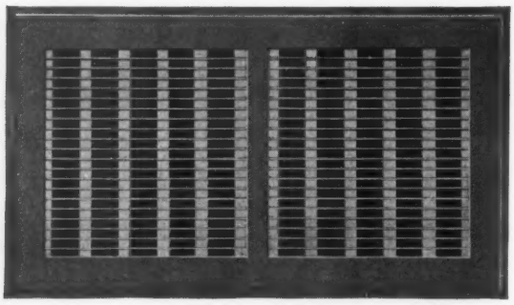


Style 170—Straight Flow with Flange-over Baseboard Frame

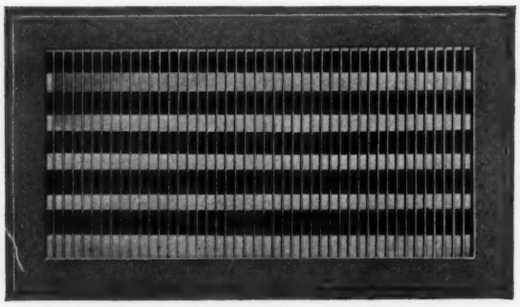
COST REDUCTION without QUALITY REDUCTION

There are Many Ways of Cost Reduction besides Quality Reduction in Air-Conditioning Registers. One Outstanding Example—the STYLE 170 Two Piece Louver-Type Baseboard Register—requires no Studding Frame—can be installed after Plastering. You would not use a Studding Frame on a National or Panama Baseboard Register—THEN WHY on an Air-Conditioning Baseboard Register.

SIMPLY FLANGE the HEAD over the FRAME, attach the Register to the Frame—about 3 to 5 maximum working minutes per register and no Return Trips. The LABOR-SAVING COST will ASTOUND YOU. JUST TRY ONE JOB.



Style 177 V. V. I. or 145 V. V. I.



Style 178 H. V. I. or 149 H. V. I.

We now announce A NEW LINE of INDIVIDUALLY-SET Shallow Blade Assemblies that may be furnished with Louver-Type and Adjustable-Bar Register as illustrated. Illustrations show Style 177 V.V.I. —Style 177 Louver-Type A-C Vent with Vertical Back-Blades. Also in Style 178 with Horizontal Back-Blades. Same equipment furnished in Adjustable-Bar Styles.

Write for Latest Catalogs and Descriptive Literature

UNITED STATES REGISTER CO.

BATTLE CREEK, MICHIGAN

MINNEAPOLIS • KANSAS CITY • ALBANY • SAN FRANCISCO • NEW YORK, N. Y.

CONTROL

COMPLETE AUTOMATIC

AUTOMATIC ● CONTROLS **MH**

DEPENDABLE CONTROLS COST LESS THAN SERVICE

MINNEAPOLIS-HONEYWELL

Corral your prospects!

ACRATHERM
■
PROTECTORELAY

LET Minneapolis-Honeywell Controls help you corral those elusive prospects... They make it easier for you to sell equipment because prospective customers recognize the prestige behind the Minneapolis-Honeywell name – the result of a half century of leadership and national advertising.

Minneapolis-Honeywell thermostats incorporate the proved and exclusive Heat Acceleration principle – a development of the M-H Series 10 Circuit, which assures precisely correct temperatures under all conditions, without fuel waste.

To insure complete satisfaction with automatic heating, equip your burners with Minneapolis-Honeywell Controls. Your customers deserve and recognize the best.

■

Dependable Controls Cost Less Than Service

■

MINNEAPOLIS-HONEYWELL REGULATOR CO.
2726 Fourth Avenue South · Minneapolis, Minn.

Install Complete Controls

Insure complete satisfaction with a complete control system. Limit controls provide a full measure of safety by preventing excessive boiler or furnace temperatures beyond the thermostat's control.

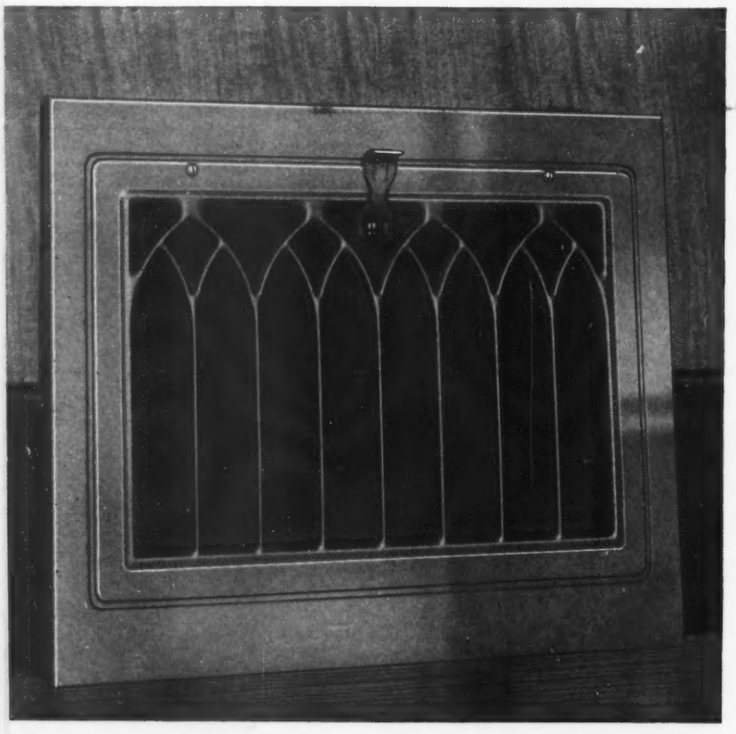
AIRSTAT

AQUASTAT

PRESSURETROL

LO-WATER CUTOFF

three TOP-HEAVY FAVORITES in the Gravity Field!



These three H & C Registers, representative of the line, are recommended to you by the finest endorsement that any article of merchandise may enjoy; an over-whelming sales lead over all competitive items in their field.

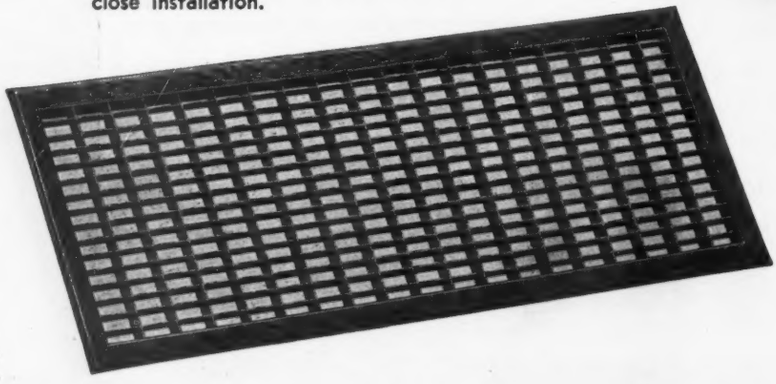
If, like most other up and coming installers, you're convinced that it pays to handle the best in registers; then, by all means, examine these top-heavy favorites at your H & C Jobbers'. You'll find that they're made better, finished better; that they do help to convert prospects into customers.

No. 37 General Catalog and No. 37AC Air Conditioning Catalog on request.

The authentic Gothic design of the H & C No. 120 Baseboard Register is, in the minds of most people, the most attractive design ever incorporated in a register. Neat, tight and secure installations are assured by lapping the stackhead over the register frame.

H&C

The H & C No. 265 "NO-FLEX" Return Air Face matches the No. 210 Floor Register. Cross members are welded to each other and to the frame for maximum strength. Upper edges of members are squared for better walking surface. Corner joints are invisible. Margins are narrow for close installation.



Above is the H & C No. 210 "NO-FLEX" Floor Register — the most popular floor register ever built. Openings are 7/16" x 1 7/16". Exceptionally sturdy, rigid and heel-proof.

HART & COOLEY MANUFACTURING CO.

Warm Air Registers, Damper Regulator Sets — H&C — Air Conditioning Grilles, Dampers, Chain, Pulleys

61 W. KINZIE STREET, CHICAGO, ILLINOIS

ENGINEERING OFFICE AND FACTORY · HOLLAND · MICH·

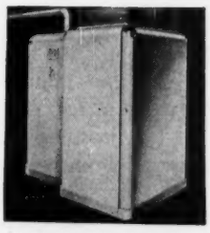
Make the FITZGIBBONS COMPLETE LINE YOUR TICKET TO 1939 AIR CONDITIONING profits!

With this varied list of air conditioning units. Whether it's conditioning one room, or an entire home — winter conditioning or summer cooling too — oil, gas or coal as fuel — top-notch quality, or the price question to the fore . . . *with the Fitzgibbons line you have the right answer, every time.*

LOOK THEM OVER — THEN ACT!

SPLIT-SYSTEM CONDITIONERS

THE BOILER-AIRCONDITIONER
Gives filtered, tempered, humidified air for selected rooms, economical steel boiler radiator heat for other rooms (such as kitchen, bath, garage) and year-round domestic hot water. A complete unit with any oil burner, gas burner, stoker.



THE FITZGIBBONSAIRE
Is designed as a companion unit with the Fitzgibbons steel boiler. May be installed without regard to boiler location. Provides filtered, tempered, humidified air for selected rooms.

THE FITZGIBBONSAIRE, Jr.
A smaller unit, works with any Fitzgibbons steel boiler, and conditions air for one or two rooms only or similar limited service. Inexpensive installation, and popular for adding conditioning in existing homes.

DIRECT-FIRED CONDITIONERS

THE DIRECTAIRE
A steel furnace unit with outstanding efficiency, ease of cleaning, quietness, fuel-saving. Made in all required capacities, easy to install. Works with any type of oil or gas burner or stoker.

THE "SPECIAL-80" DIRECTAIRE
A direct-fired conditioner with the same high quality Fitzgibbons construction and material throughout, but designed, sized, and priced especially for the small home. Recognized as a big step forward in greatly broadening the conditioner market.

SUMMER COOLING
THE FITZGIBBONS COOLING SYSTEM comprises a complete line of compressors adaptable for the addition of summer cooling to any Fitzgibbons conditioner. This addition may be made when conditioner is installed, or at any time thereafter.

HERE'S A LINE YOU CAN SELL
Authorized dealership still obtainable in certain selected territories. Get all the facts—write or wire today—mail the coupon immediately.

AA-11

FITZGIBBONS [illegible]R COMPANY, INC.
101 Park Ave., [illegible]ork, N. Y.

Send me details about the Fitzgibbons line of Air Conditioners [illegible]bout the Fitzgibbons Authorized Dealer Franchise.

Name.....

Address.....

HOW A PROFITABLE BUSINESS *grew out of a Bucket!*

Textile plants use hundreds of large buckets like these for handling dyes. With so many mills now going on the "Stainless Standard," here is a worthwhile opportunity for fabricators to sell buckets and other sheet-metal products of U·S·S Stainless Steel.

JUST a bucket, to be sure, but not an ordinary bucket. It's made of U·S·S Stainless Steel. Six years ago, a sheet-metal fabricator sold it to the superintendent of a large dyeing and finishing plant, for use in handling and storing acid dyes. The superintendent was skeptical, bought only one. Said he wanted to see how it would stand up in service.

A year later, he had his answer — that stainless steel bucket was still as good as new. Ordinary steel buckets, which he had been buying on the open market at a rate of from 48 to 96 a month, lasted only a few months. So he promptly replaced them all with stainless steel. Of course, the same fabricator got the order.

Ever since the superintendent made that decision, his bucket replacements have averaged only 10 a month. Naturally he is pleased with the savings. And the fabricator enjoys a steady and profitable business.

But this was only the beginning. The stainless steel buckets gave such good service that much of the other dyeing equipment was soon lined with U·S·S Stainless Steel, and maintenance now costs 90 per cent less than before. The bulk of this business, of course, went to the original fabricator. And it all started with a single bucket!

U·S·S Stainless Steel has the knack of selling itself wherever corrosion resistance and mechanical strength are important qualities. In dozens of cases, fabricators have reported tonnage orders that started with orders as small as a bucket. Are you getting your share of this profitable business?

U·S·S STAINLESS STEEL

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
NATIONAL TUBE COMPANY, *Pittsburgh*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Non-Freeze
Uniform Temperatures
using
AEROFIN HEAT EXCHANGE SURFACE

NOW you may place heating coils in the cold air stream and obtain uniform temperature over the entire face of the coils even when steam is throttled for partial loads during freezing weather. The unique dual-tube design of this newest Aerofin development distributes steam so that stratification is prevented over the face of the coils at any percentage of heating capacity.

The new Aerofin Non-Freeze Heat Exchange Surface introduces steam from an inner tube, through orifices into the outer tube. The supply and return are located at the same end of the unit. In this way, the condensed steam flows back around the heated inner tube, preventing the condensate from freezing. This allows any degree of steam throttling without danger of freezing.

As an economy result, the necessity for using a separate tempering coil is eliminated, reducing the number of valves, traps and piping; and control is greatly simplified.

AEROFIN Non-Freeze Coils are available now in one row units, giving a temperature rise from 0 degrees to 81 degrees at 5 pound steam pressure and 500 feet face velocity. For ventilation, where 0 degree to 81 degrees or less are required, only one coil in depth is necessary, thus eliminating the use of a tempering and reheating coil. Aerofin Non-Freeze Coils can be used with Aerofin Flexitube where higher temperature rises are desired. Casings are of galvanized iron flanged for direct duct connections in Aerofin standard sizes. Overall casing dimensions are the same as Aerofin Flexitube, except for depth in direction of air flow. The depth of the coil casing is 5 inches instead of the standard 10 inch depth for Aerofin units.

All piping strains are transmitted to the casings without imposing any strains on the core. Each tube is free to expand or contract independent of adjacent tubes. Cores are pitched in the casings, allowing units to be installed in any position without pitching the heater casings.

These provisions for assurance of continuous heating without danger of freezing are available only in Aerofin Non-Freeze Coils.

Request your copy of the Descriptive Bulletin describing this newest Aerofin development.

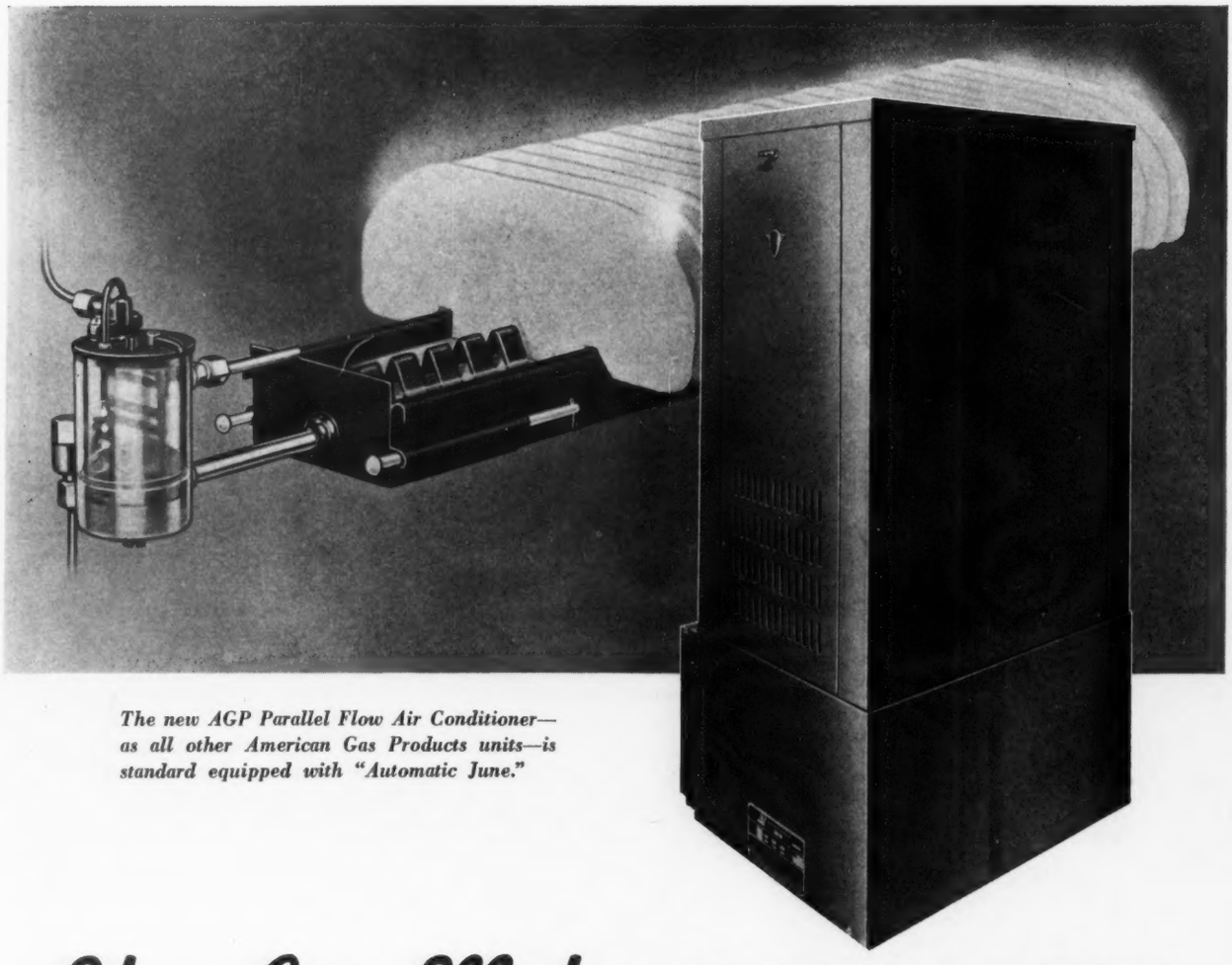
AEROFIN CORPORATION
410 So. Geddes St.
Syracuse, N. Y.

Please send at once your new illustrated bulletin describing Aerofin Non-Freeze Coils.

Name.....

Firm.....

Address.....



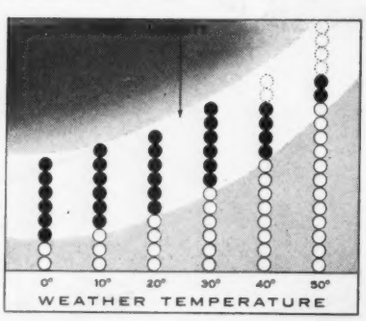
The new AGP Parallel Flow Air Conditioner—as all other American Gas Products units—is standard equipped with "Automatic June."

You Can Make MORE MONEY

SELLING CONDITIONERS EQUIPPED WITH "AUTOMATIC JUNE"

It is so much easier to sell *with* than *against* Automatic June, that the standard equipment swing to this graduated humidity control is readily understandable.

At last it is practical to assure ample capacity under the low bonnet temperatures of modern conditioners. Automatic June, with its exclusive sales-point of "never too little and never too much," has always been a great sales advantage. Today it is rapidly becoming *necessary* to have Automatic June in order to sell successfully in competition.



No other unit can even claim the advantages of Automatic June. Basic patents will insure that this will continue for many years. The public has discovered that there *is* a way to insure perfect humidification and they are buying it.

To dealers not handling the AGP line or one of the other lines that have adopted Automatic June, we will be glad to send complete information and a list of manufacturers offering this unit as standard equipment.

◆

MONMOUTH PRODUCTS CO.
General Offices and Factory
1933 E. 61st St.
CLEVELAND, OHIO

AUTOMATIC JUNE
GRADUATED HUMIDITY CONTROL

Trimming an etched stainless steel sign

Easy Workability Assured

RYERSON Certified Steel Sheets represent the highest quality obtainable. All the different kinds are carefully tested to see that they have the qualities most desired for their particular purpose. They are carefully checked for finish, flatness, gauge and size accuracy.

Prime quality, workable sheets are assured. Ryerson Certified Steels also include Bands, Channels, Angles and all other steel products for the sheet metal worker. You can save time and money by concentrating your purchases. Let one order to Ryerson cover all of your steel requirements.

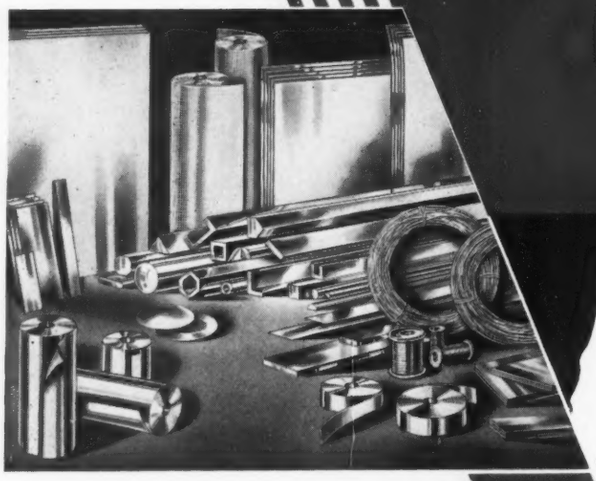
Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City

RYERSON *Certified* **STEELS**

RYERSON SHEETS INCLUDE:

Allegheny Stainless	Galvanized	Stretcher Levelled
Blue Annealed	Panel and Sign	Uniform Blue
Copper Alloy	Galvannealed	Vitreous Enameling
Corrugated	Heavy Hot Rolled	Wellsville Polished
Deep Drawing	Long Terne	and Many Others

A complete COPPER and BRASS SERVICE for the SHEET METAL WORKER



HUSSEY
PURE LAKE
COPPER

WAREHOUSE STOCKS IN THE PRINCIPAL CENTERS

The nationwide availability of Hussey Pure Lake Copper steps up deliveries from days to hours . . . enables you to carry minimum copper inventories . . . gives you a complete selection of sheet and roll copper in all finishes for every sheet metal application as well as a complete line of copper roofing materials in all sizes and styles.

Let us help you get out that next job quickly and correctly.

C. G. HUSSEY & COMPANY
(Division of Copper Range Co.)
Rolling Mills and General Offices: Pittsburgh, Pa.

Copper **HUSSEY** Brass

No Extra Cost FOR ADDED PROTECTION IN DAMP BASEMENTS AND CLIMATES

PREVENTS CHAFING FROM VIBRATION

Complete Stator Frame of Century Fractional Motor Showing Windings protected with the NEW Century Insulation Process.

RESISTS MOISTURE

RESISTS OIL

RESISTS ABRASIVE DUST

MUCH GREATER RESISTANCE TO MOISTURE NOW ASSURED BY *New* CENTURY FRACTIONAL HP MOTOR INSULATION

Motors located in damp basements and climates are subject to trouble caused by moisture soaking into the insulation and paving the way for breakdowns. . . . This results in complaints . . . dissatisfied customers . . . expensive service calls . . . lost time.

Before you make any commitments be sure to investigate this new Century Insulation Treatment. . . . It resists deterioration and absorption of moisture. . . . It cements the coils together. . . . Prevents "chafing" between wires. . . . Resists mechanical abrasion. . . . Is thin enough to radiate heat.

Ask for Century Motors on your next order for appliances and get this extra insulation protection at no extra cost. 31 conveniently located branch offices and national service setup at your service.

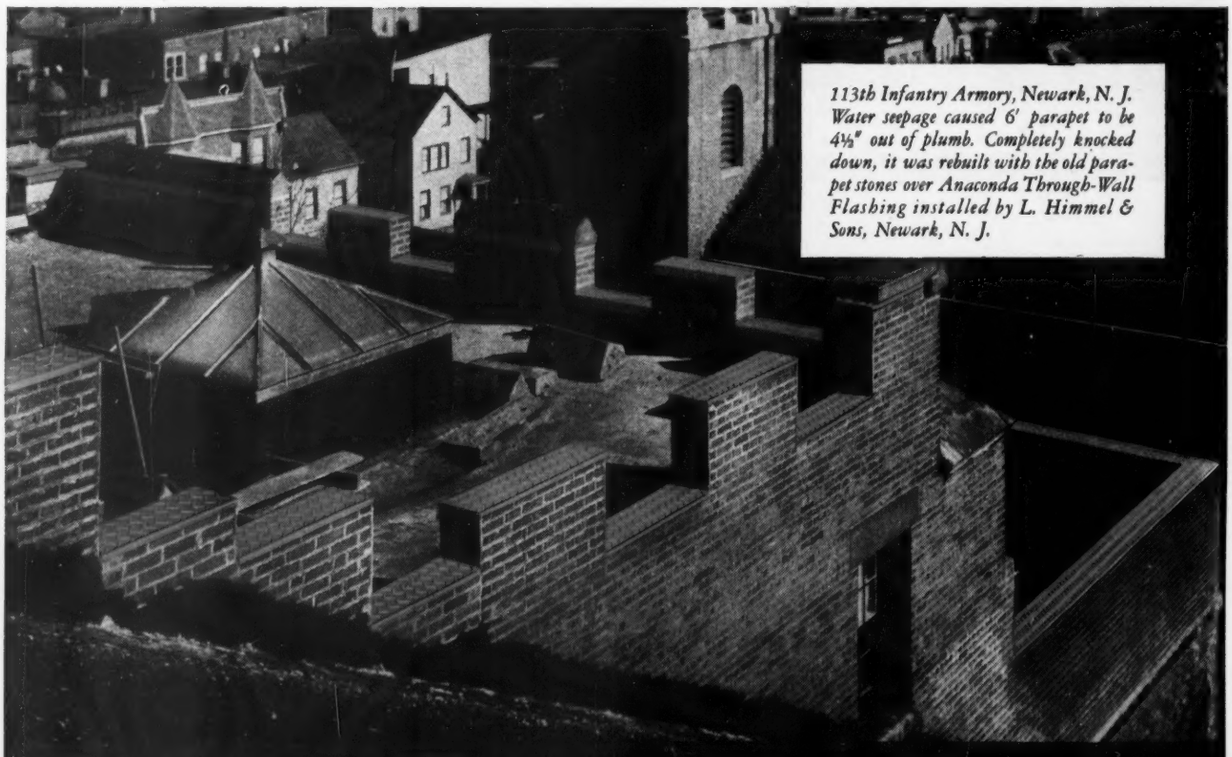
Century MOTORS

CENTURY ELECTRIC COMPANY

1806 Pine Street • • • St. Louis, Mo.

Offices and Stock Points In Principal Cities

ONE OF THE LARGEST EXCLUSIVE MOTOR MANUFACTURERS IN THE WORLD



113th Infantry Armory, Newark, N. J. Water seepage caused 6' parapet to be 4½" out of plumb. Completely knocked down, it was rebuilt with the old parapet stones over Anaconda Through-Wall Flashing installed by L. Himmel & Sons, Newark, N. J.

Anaconda Through-Wall Flashing

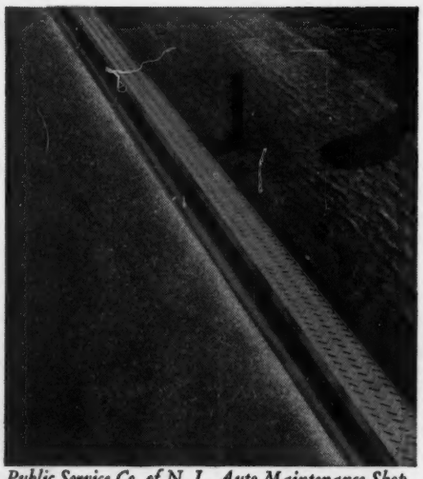
Overcomes Seepage Problems

ANACONDA Through-Wall Flashing — efficient, positive and durable — is readily adaptable to practically every masonry condition, yet relatively low in cost. Important feature of its design is a series of zig-zag ridges 7/32" high intersected at one end by a 7/32" longitudinal ridge which acts as a dam. The zig-zag ridges prevent lateral movement, while the longitudinal ridge causes any accumulation of water to drain out the opposite face of the wall.

This highly effective through-wall flashing — made of 16 oz. Anaconda Copper, plain or lead-coated — is available in a variety of types and sizes, including one-piece inside and outside corner flashings. Standard flashing for 8" and 12" walls in five-foot and eight-foot lengths is stocked by leading supply houses. Other types, with special widths, lengths and selvages, are available on order.

Because Anaconda Through-Wall Flashing can be bent and cut to fit on the job, it is doubly economical to use, for it can be installed quickly and easily, with a minimum of delay to bricklayers and masons. Write for Anaconda Publication C-28. It contains complete description and suggested specifications.

38122



Public Service Co. of N. J., Auto Maintenance Shop, Newark, N. J. Water had been seeping through the fire separation wall. Anaconda Through-Wall Flashing and Anaconda 16 oz. crimped copper counter flashing were installed by L. Himmel & Sons, Newark, N.J., to make the wall leak-proof.

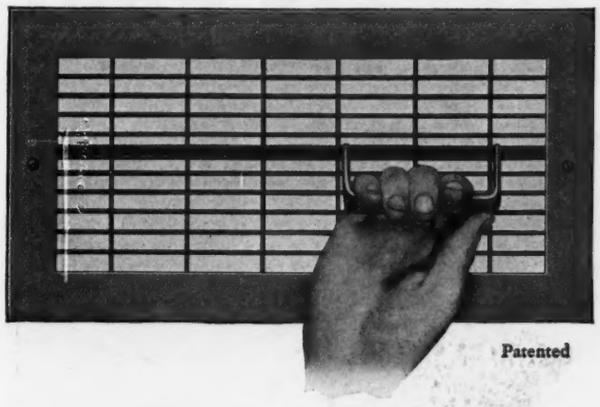
ANACONDA
from mine to consumer

Anaconda Copper

THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Connecticut

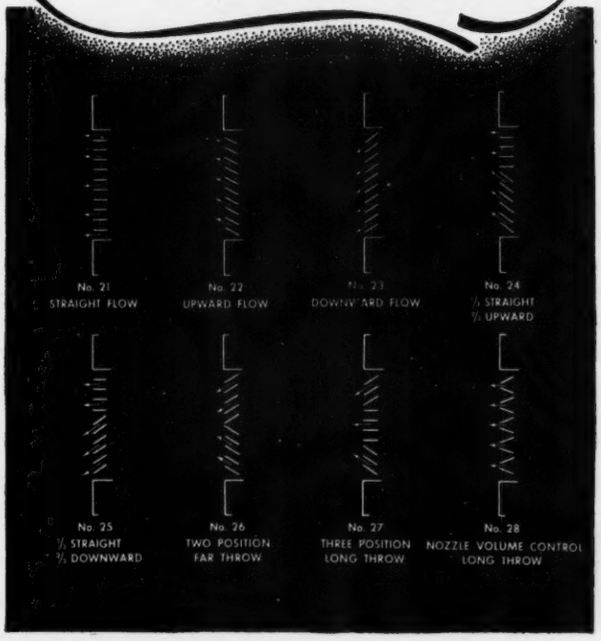
In Canada: Anaconda American Brass Ltd., New Toronto, Ont. • Subsidiary of Anaconda Copper Mining Co.

INDEPENDENT "FABRIKATED" *Adjustable*
DIRECTED AIR FLOW REGISTERS AND GRILLES
Distribute, Concentrate or Deflect Air Flows with Unequalled Precision



Patented

INDIVIDUAL ADJUSTMENT OF GRILLE BARS EFFECTS THESE AND MANY OTHER DEFLECTIONS OF AIR FLOWS



Two-Prong Tool Makes Adjusting *Easy at Any Time*

• Before installing, or after the register is in place, any grille bar can be set at any angle to produce any desired deflection of air flow... It is not necessary ever to take out the register after it is once in place; for no locking is required to hold the grille bars firmly in place. Grille bars are so mounted and further secured by cross members that they are rattle-proof, tamper-proof and vibration-proof. The special two-prong tool is required to change adjustment, and with this special tool it is an easy matter.

With individual adjusting of grille bars, heating engineers can achieve effects in air flows impossible in any other way.

Independent "Fabrikated" *Adjustable* Directed Air Flow Registers and Grilles are made in any size with either vertical or horizontal grille bars to deflect air flows right or left, or up or down, to any desired angle. They are unexcelled in strength, rigidity, appearance and range of directed air flow.

Write for catalog and data book.

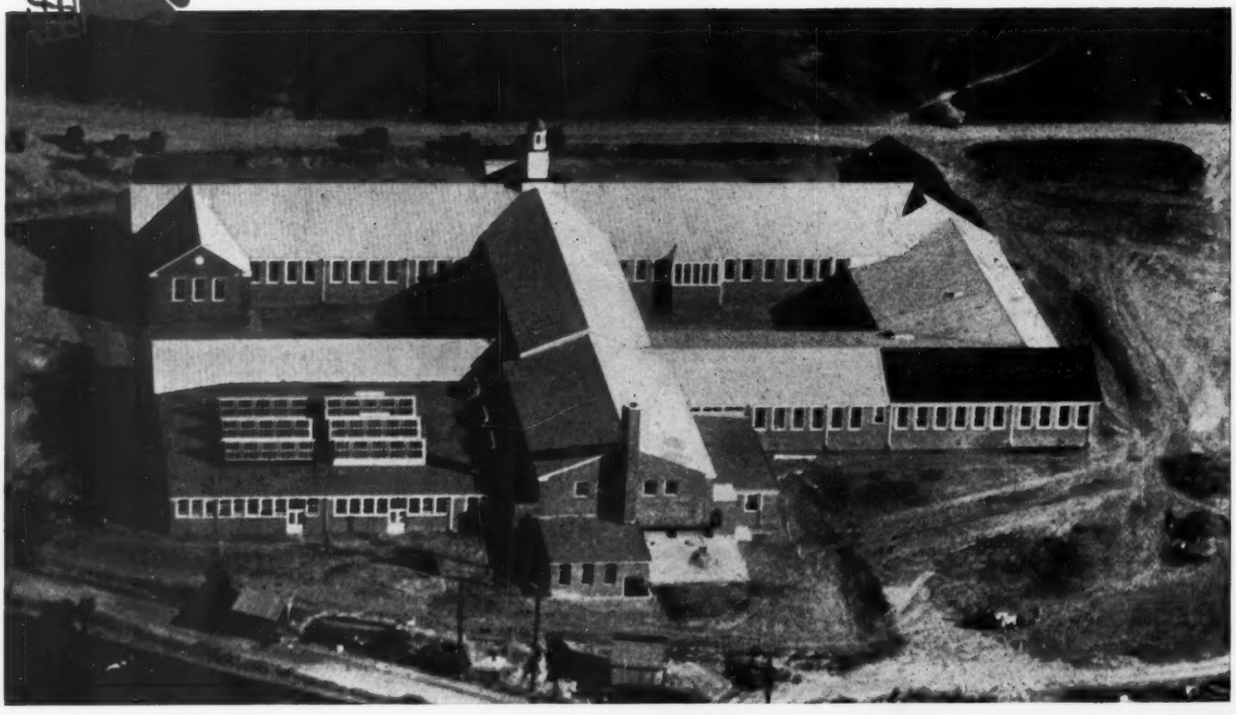
THE INDEPENDENT REGISTER COMPANY

3741 East 93rd Street, Cleveland, Ohio

easy to sell

easy to work

more profits for you!



Almost 40 tons of galvanized ARMCO Ingot Iron cover the roof and drainage system of this southern high school. Flashing and skylights were made of the same durable material.

You know how important to profits is your reputation for prompt service, skillful work and use of good materials. You can distance competition and earn extra profits when you standardize on durable galvanized ARMCO Ingot Iron.

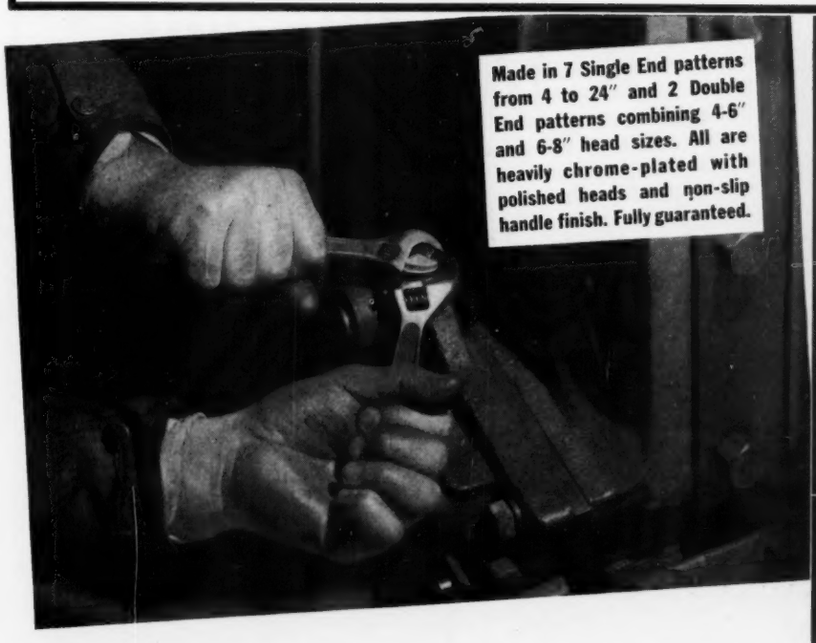
Here is the commercially pure iron with actual service records over a period of thirty-two years to prove its lasting qualities and owner economy. National advertising since 1914 has gained for it strong public preference. Your customers are familiar with ARMCO Ingot Iron and have confidence in it. For your part, you'll find that it provides ample strength for construction; yet is pliable and shapes up neatly and accurately.

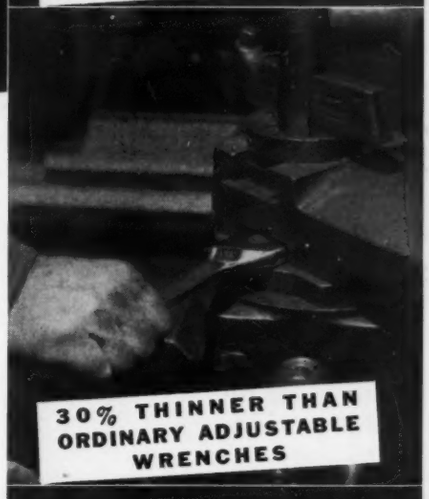
Explain the good points of ARMCO Ingot Iron to your customers: They give you a sales story both unique and profit-making. The nearby Armco distributor has ample stocks and will serve you promptly. Place your order through his salesman and be sure to inquire about the many business-promoting services he offers. The American Rolling Mill Co., 2721 Curtis St., Middletown, O. Offices in key cities.

ARMCO

ARMCO INGOT IRON

MORE POWER PER OUNCE IN
CRESTOLOY WRENCHES


Made in 7 Single End patterns from 4 to 24″ and 2 Double End patterns combining 4-6″ and 6-8″ head sizes. All are heavily chrome-plated with polished heads and non-slip handle finish. Fully guaranteed.



● In Crestoloy Wrenches you get *lightness, trimness* and extreme *strength* . . . all three in a design which really provides much more in convenience and utility than you may at first imagine. Crestoloy jaws, for example, are 30 percent thinner than those of ordinary steel wrenches. They will reach in many places where a thicker wrench head simply will not go. They are surprisingly light—a 12-inch wrench weighs 13 ounces. They are easy to handle and fast to work with.

Crestoloys take all the gamble out of wrench buying. They cost but little more than tools made primarily to sell at a price. They are actually cheaper because they deliver much more in usefulness and user satisfaction. And finally, they bear the guarantee of the originators of the Crescent-type wrench . . . the manufacturer who has pioneered every advance including the thin-type alloy steel design.

For value and performance, insist on Crestoloy Wrenches.

33-114A

CRESCENT TOOL CO., JAMESTOWN, N. Y.

Here's the Filter You've Been Waiting For... Permanent, Washable ...and LOW-PRICED, too!

The New A/C 2 Permanent Washable Filter

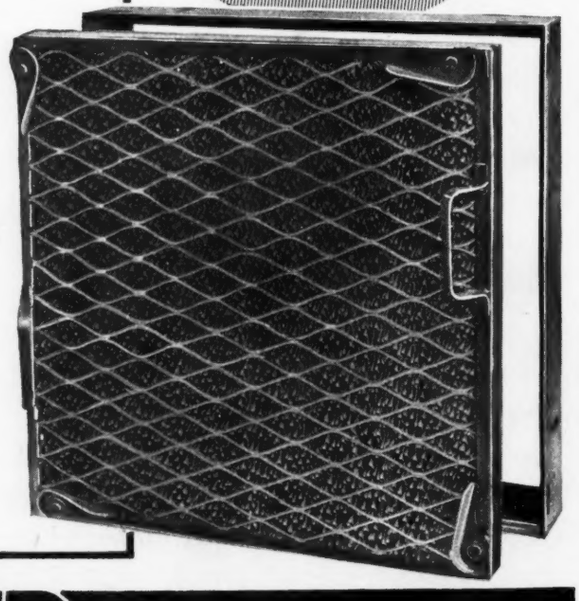
was developed especially for air conditioning service where washable filters are desirable and requirements are not abnormally severe.

Investigate its Possibilities

Warm air heating and air conditioning engineers are quick to recognize the economy and superior advantages of permanent type filters because they know that the price of clean air is the combined initial filter cost *plus* the expense of maintenance.

The new A/C-2 meets every filter requirement and can be cleaned at a cost of less than five cents for Viscosine. Compare this figure with the unit cost of one dollar or more for filters of the renewable type, and the economy of the A/C-2 is apparent.

Write for Bulletin 117-E for complete data on the new A/C-2 Filter.



AMERICAN AIR FILTER CO., Inc.
Incorporated
102 Central Ave., Louisville, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

Visit our booth No. 76-77 at the Power Show in New York City, December 5th to 10th

AMERICAN AIR FILTERS

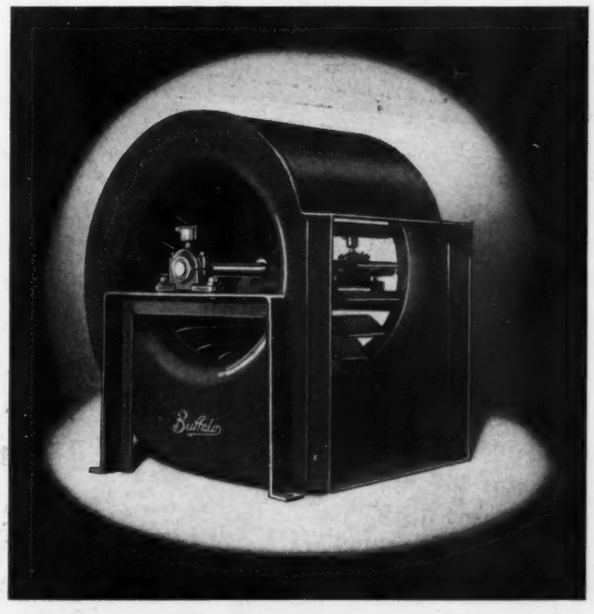
SCENES LIKE THIS
CHANGE TO THIS
THAT D--- FURNACE IS DRIVING ME WILD
YOU SHOULD HAVE TAKEN THE CONTRACTOR'S ADVICE AND PUT IN THAT BUFFALO FAN
SAME SCENE A FEW DAYS LATER
IT'S VERY COMFORTABLE HERE BUT I HAVENT HEARD THE FURNACE GOING
YOU CAN THANK OUR NEW BUFFALO FAN FOR THAT

When you replace cheap noisy fans with "Buffalo" QUIET HVA FANS

• Heating contractors who believe in the old saying that "A Satisfied Customer Is the Best Advertisement" are finding that one of the best ways to be sure of satisfied customers on those forced warm air heating jobs is to install Buffalo QUIET HVA Fans.

These fans are not only quiet but highly efficient—delivering a maximum volume of air at a negligible power cost.

Buffalo HVA Fans are furnished either with or without motors and in designs for placement of motor either at the base of the fan or on top.



Remember, when you install Buffalo HVA Fans on your forced warm air heating jobs you are giving your customers the benefit of over 60 years of leadership in fan design and engineering.

Have you seen our bulletin 2947-B? We shall gladly send you a copy on request.

BUFFALO FORGE COMPANY

497 Broadway Buffalo, N. Y.

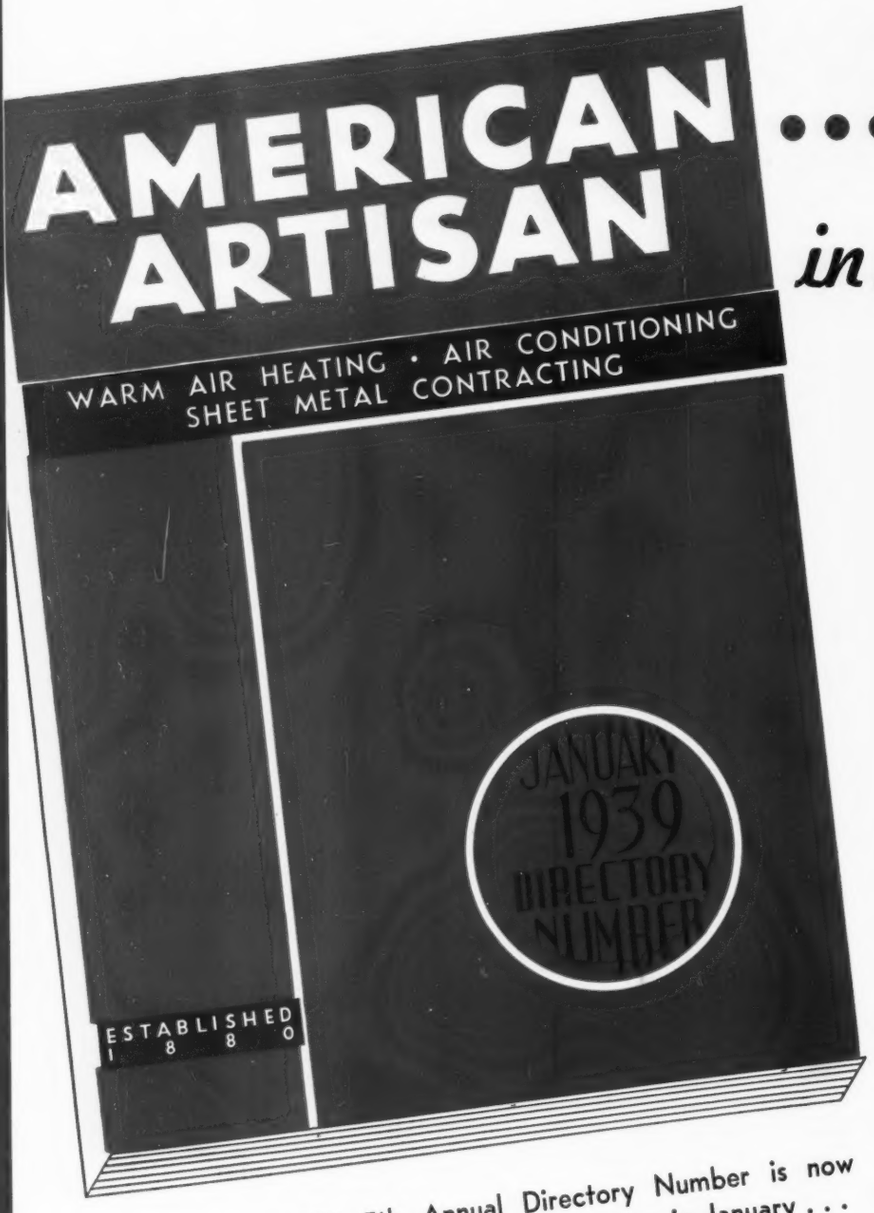
Branch Engineering Offices in Principal Cities

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

RESERVE SPACE ...NOW!

AMERICAN ARTISAN

in the **ACE** *of issues*



The January 1939 ANNUAL DIRECTORY NUMBER

AMERICAN ARTISAN'S 7th Annual Directory Number is now being prepared and will be ready for distribution in January . . . The 1939 edition will contain complete, up-to-date listings of all products used in warm air heating, residential air conditioning and sheet metal contracting work, with names of their manufacturers, trade names and full addresses . . . It will be bound in a special, heavy cover to withstand the wear and tear of reference to it throughout the year . . . Dealers, contractors and wholesalers will find it answers every question of "who makes it" and "where are they located" . . . That is why leading manufacturers already have this January Directory Number on their advertising schedules for full presentations of their lines . . . No increase in rates over regular issue . . . Reservations are now being accepted.

The Directory Section

● PRODUCTS CLASSIFIED

In this section every product and accessory used in industrial and commercial warm-air heating, air conditioning and sheet metal contracting will be listed. Under each one will be the names of all manufacturers who make it. A dealer or contractor who wants to know where to buy or secure information on certain products can turn to this section, find the products properly indexed and cross-indexed, see under it the names of the manufacturers who make them.

● TRADE NAMES

Here the buyer who knows a product only by its trade name can find its maker by looking for the trade name in its proper alphabetical place. Every trade name of a product in this field is listed in this section, with the product it designates and the name of its manufacturer.

● MANUFACTURERS ADDRESSES

In this section all manufacturers will be listed with complete street address and city. Here the buyer finds where to direct his inquiry or order.

AMERICAN ARTISAN

North Michigan Avenue Chicago, Ill.

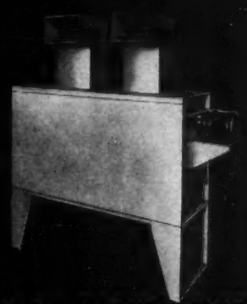
TRANE SETS THE UNIT HEATER PACE

TRANE

AIR^{n} Unit Heaters

PROJECTION HEATER
Salvages Ceiling Heat

STANDARD PROPELLER TYPE
Quiet, efficient Spot Heating



TORRIDOR—BLOWER TYPE
Either belt or direct driven

Trane engineering knowledge, in collaboration with Architects, Engineers and Contractors, enables us to offer the greatest line of Unit Heaters.

Trane manufactures a limitless variety of sizes and styles to meet your every requirement. Old-fashioned cast iron pipe coils and radiators—yes, and even ordinary unit heaters have passed out of the picture. Trane Unit Heaters, with their many advantages, are constantly broadening the field of unit heater application. Not only factories, and garages, but shops, offices, lunch rooms, dance halls as well. Any space is a prospect for some type of Trane unit heater. Only a line like the great Trane line can provide the exact type.

There are huge Trane Torridor Blower Type Units for the delivery of large quantities of heated air. There are Model "N" Propeller Type Unit Heaters which have solved heat problems in factories and commercial establishments the country over . . .

And, in the amazing Projection Unit Heater there is the most advanced development in years and years—for loss of heat, at ceilings, is now licked, and what was formerly wasted heat is put to work down at the floor level where it belongs.

The scope of installations of Trane Unit Heating Equipment is interesting information for every Engineer and Contractor. We urge you to write and ask for Unit Heater Bulletin No. S-327. In it you will find an answer for new building or remodeling requirements.

FAN
New 4 Blade Fan. Balanced and formed to eliminate noise due to air friction.

CRADLE COIL
(Cut-Away Section)
Showing how coil is spring cradled in casing. Eliminates all stress and strain due to expansion.

Because of the exclusive Trane feature known as "Balanced Pressure" Trane Traps will withstand extremely severe operating conditions. A rupture due to pressure differences is a physical impossibility with Trane Traps.

FLOAT TRAP
Equipped with the famous Trane balanced pressure thermostatic bellows that locks against steam and lasts indefinitely.

FLOAT VENT
Extra large air capacity through ¼-inch port. Float seals against water leakage. Bellows closes port against steam leakage.

BUCKET TRAP
Designed for use with Blast Coils, Unit Heaters or at low points on high pressure steam lines to clear condensation and discharge air.

TRANE

THE TRANE COMPANY (AIR^{n}) LA CROSSE, WISCONSIN

Also TRANE COMPANY OF CANADA LTD., TORONTO, ONTARIO

Unit Heaters · Specialties · Convectors · Climate Changers · Cooling Coils · Unit Coolers · Blast Coils · Unit Ventilators

WHAT WOULD YOU USE HERE.....?

● On this duct job, the owner wanted a material that would resist rust and corrosion—that would last—that would protect him against the cost of replacement due to premature failure. So, the contractor used Toncan Copper Molybdenum Iron—the sheet with the highest rust-resistance in its price class.

Had it been an ordinary sheet metal job, the contractor probably would have used Republic steel sheets. They are uniform in quality, easy to work and suitable for all ordinary work. Again, had the job involved atmospheric corrosion, he could have used Republic copper-bearing steel sheets. Had it been a roofing job, he most likely would have used Taylor 40-pound copper-bearing roofing ternes. Or, if the job required the finest steel sheet available, either for resistance to corrosion or for beauty of finish, he could have used ENDURO Stainless Steel.

You will have all of these sheets available, too—you will be ready to take any type of sheet metal job and make a profit on it—if you use the Republic line of sheets. It provides for every need in sheet metal. Republic Steel Corporation, Cleveland, O.

REG. U.S. PAT. OFF.
REPUBLIC STEEL
SHEETS
There's a grade, size and finish for every need.

REPUBLIC STEEL

BERGER MANUFACTURING DIVISION
NILES STEEL PRODUCTS DIVISION
UNION DRAWN STEEL DIVISION
TRUSCON STEEL COMPANY
STEEL AND TUBES, INC.

AMERICAN ARTISAN

Volume 107 Number 11

Merrily We Roll Along

PRELIMINARY reports covering prices at which winter air conditioning systems (or sheet metal work, for that matter) are being installed across the country indicate that in many communities "value" is being lost sight of in the scramble to offer a price below competition. In other words, "value" is discarded in favor of harmful corner cutting to bring down the price to the level of the man willing to work for day wages.

The fallacy of this policy comes from the fact that the man willing to work for day wages never has any set day wage. If, today, he is satisfied with ten dollars a day, tomorrow he will be satisfied with five dollars a day. Of if he is not willing some other man is. Business history shows that eventually these day wages get so low that even the day wage'r must close up shop, but when he does, what of it? The chances are this day wage'r did not have much to start with; when he goes out of business he has lost little or nothing; his community never misses his going; his creditors (if he ever had any) hold the bag; and two other men are waiting to step into his place.

Not long ago a contractor told us that after more than twenty years in the warm air heating business he was discontinuing this line of activity because "men like so-and-so" were willing to take jobs at a price this contractor's cost accounting system showed was impossible without drastic reorganization. So-and-so, we found, had a similar complaint. He, in turn, was bemoaning the state of affairs which permitted ex-mechanics to take work so much below his price that his business was being ruined.

Out of curiosity, we traced an ex-mechanic reported to work for day wages who recently had taken three of so-and-so's jobs because of lower price. This ex-mechanic claimed to make a "living" at the prices quoted and said he at least was keeping off relief and when "things picked up" he either would launch out in a business-like way or go back to work for his old employer at day wages considerably above the money he could make operating on a shoe string.

But "keeping off relief" we learned, also had its difficulties. The day wages earned were sufficient. providing these wages could be procured week after week. The fly in the ointment was two handimen who didn't know the wages an ex-sheet metal mechanic was entitled to and could and would, therefore, install a furnace at day wages satisfactory to a common laborer.

Now each of these "contractors" in turn, saw only the man immediately below him in price. If only this one immediately below could be removed from the scene, things would be rosy. What each in turn failed to appreciate was that each in turn was only one step in this so-called "price picture" and that, as in any line of business, there is no bottom to price, **except value.**

The comparison of the thirteen seventy-five suit and the fifty dollar suit has been propounded so often, it has become tiresome. And yet, there is a "value" to everything. Value is not necessarily low price. The article which costs most may, in the long run, be the better value. Even today when, so we are told, business is in the midst of a buyer's market, people may jam the aisles of the store which "will not be undersold" and handles job lots, incomplete lines, bankrupt stocks, but will still go to "quality store" when buying a present or seeking real value.

This warm air heating business, so far as we can observe, is not exactly akin to retail merchandising. Retailers can run "specials" to bring in the crowds hoping thereby to sell other merchandise at a fair profit. Merchandise in warm air heating cannot be minutely compared on the basis of so many threads to the inch, or hind quarter vs. fore quarter, or market fattened vs. range fed, or tool steel vs. cast iron.

Type for type, warm air heating can only be compared on the basis of quality of design and installation, service and reputation, weight and gauge of material used. The purveyor of warm air heating must, thereby, place a value on this service and reputation and sell this value to the buyer.

A growing number of contractors have accepted this business premise and have deliberately set themselves within a certain "value" bracket. Other than "laid in lap jobs" these contractors cannot and do not venture into the value market above or the value market below their chosen bracket. In some instances this has meant abandoning elaborate show rooms and drastic reorganization. In other cases this choice has meant deliberately stepping up the face the public sees. Successfully and courageously applied, this plan has meant deliberately losing work which falls outside the chosen bracket, but concentrating intensely upon the work within the chosen field. Every man, seemingly, has some "value" bracket he best can sell and, when operating within this bracket, can convince the buyer that he is offering the most value for every dollar.

This is no cure-all for a business problem. Nor a panacea for the man who never can sell **any** value. But in this day of intensive competition it may permit a man to concentrate his best abilities upon the market in which he is best equipped to operate and in which he is organized to make a profit.

Powdered Milk Silo with Metal-Lined Floor and Walls

SOME years ago a large manufacturer of powdered milk called upon the sheet metal contracting firm of Jacob Brenner Company, Inc., Fond du Lac, Wisconsin, to submit suggestions for lining the inside of a powdered milk silo. The only instructions given were that the sides and floor must be smooth enough to clean easily and tight enough to enable employees to empty the silo without raising clouds of milk "dust."

This silo was circular—approximately 28 feet in diameter and 28 feet high—with two adjoining, low-ceilinged rooms. The floor, walls and ceiling of the silo and two rooms had to be lined completely. As explained to the Brenner firm, the liquid milk, partially dewatered, is blown into the silo through small ports around the top under high pressure. This pressure atomizes the milk, changing the liquid milk to powder so that by the time the milk reaches the floor there is no liquid—only the powdered milk. To aid in the drying and powdering process large volumes of warm air are introduced into the center of the silo through a stack which rises about one-third the silo height above the floor.

With these specifications and needs in mind, the Brenner firm submitted suggestions for lining the ceiling, walls and floor with flat-locked and soldered 4X dairy tin. So far as the metal contractor's suggestions were concerned the suggestions were satisfactory, but wet silo planks were used and after a time these planks dried and shrunk reducing the diameter about 3 inches half way up the walls and causing the tin to belly around the walls, later breaking some of the seams. To rectify the trouble the planks had to be spread by inserting slivers of wood between planks. The lesson learned from this first silo was to use dry lumber.

As a result of the knowledge gained in lining this first silo, construction now employs the features shown in the photographs and details. Inci-

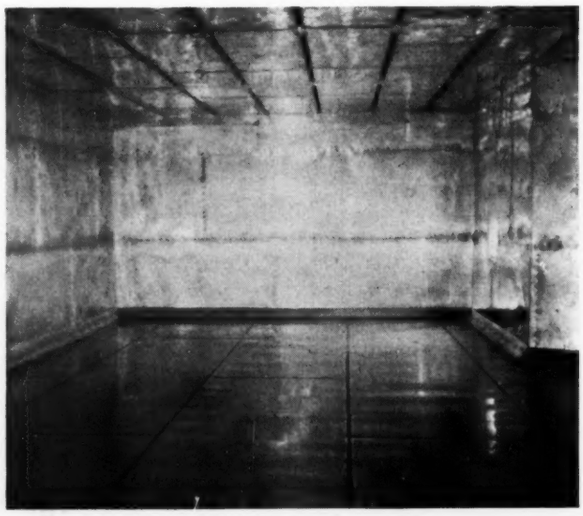
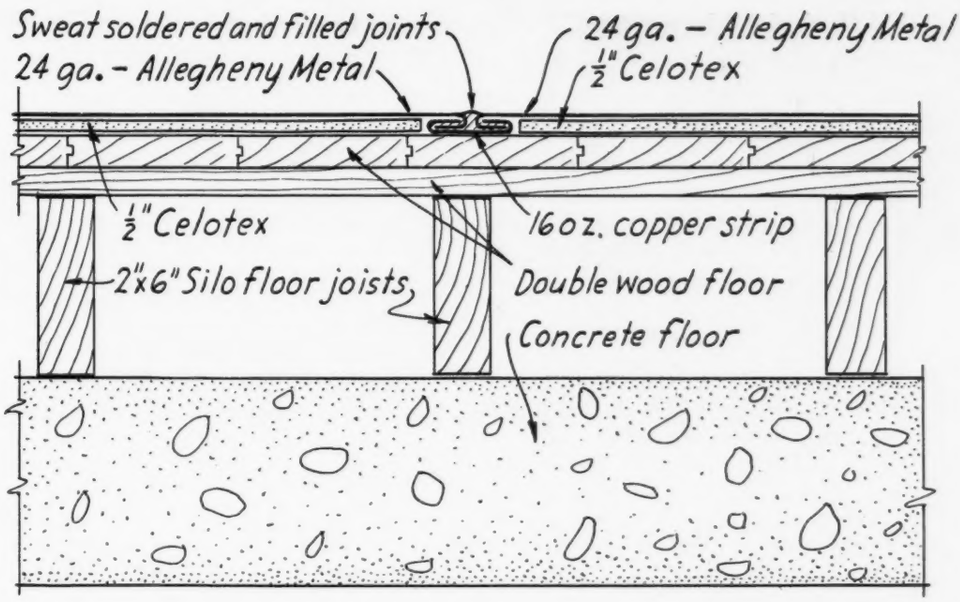


Photo-flash photographs of silo interior showing (above) the Allegheny Metal floor constructed as shown in detail opposite and tin-lined walls and (below) floor, walls and ceiling of "exhaust" room with Allegheny Metal floor, 4X tin-lined walls and ceiling. The flash reflection emphasizes the smoothness of the metal lining.



dently, the Brenner company has since lined a total of seven silos throughout the middle west.

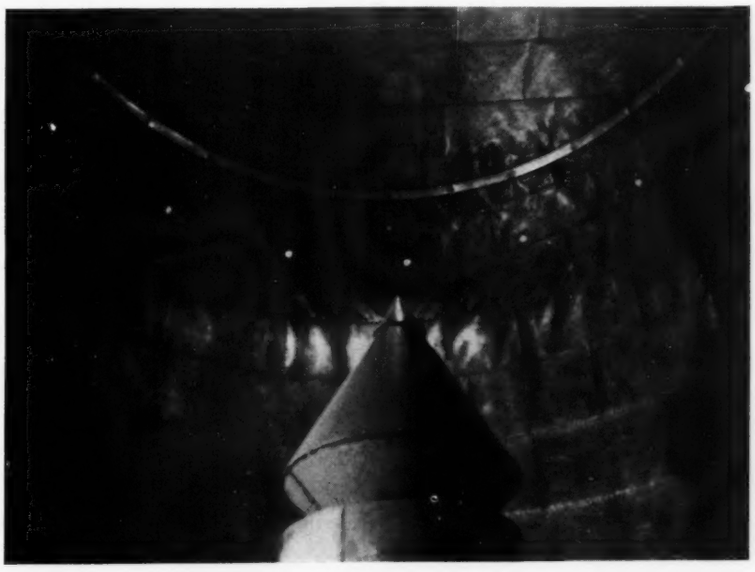
One such betterment in later silos is the use of Allegheny metal for the floors of the silo and adjoining rooms—the use of tin has been continued for walls and ceilings because these walls and ceilings carry no weight or traffic and must only be easily cleanable. The photographs and sketches shown here illustrate the construction of the last built silo.

To build the floor which must carry traffic, be sanitary, absolutely tight at all seams and afford quick emptying by squeegees (these squeegees do not make a spark) the latest construction is shown in the sketch of the floor. As shown, silo floor joists are placed on edge on a concrete slab and across these joists a tight, tongue and groove, double wood floor is nailed. Over the wood floor a layer of ½-inch Celotex is placed to act as an insulator for the "stainless steel." In this silo 24-gauge Allegheny metal sheets 36 inches wide and 120 inches long are adjoined with all four edges turned for single locks for seams. (*See sketch.*)

Critical Floor Seams

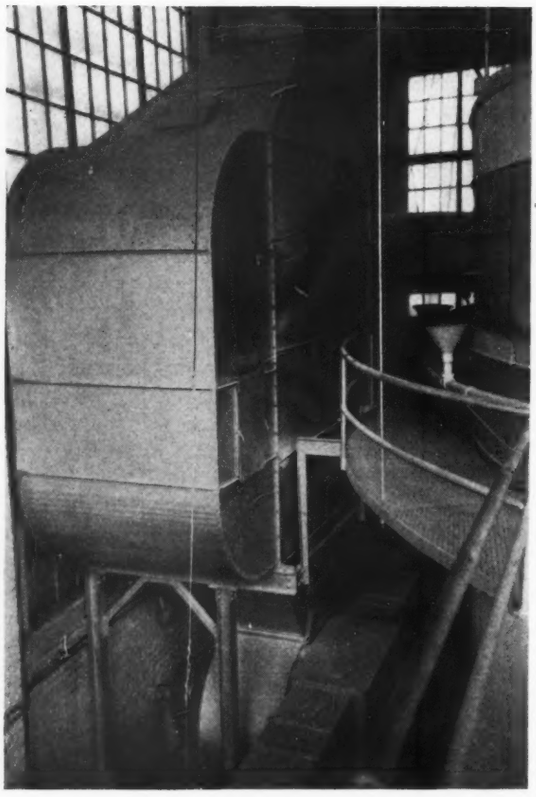
These seams, which are the critical points of construction, come at gaps made in the insulating board as shown. To hold adjoining Allegheny metal sheets together a strip of 16-ounce copper is folded into the single lock and the resulting seam is sweated and filled with solder—later scraped off for glass smoothness. The copper strips are nailed in place in the groove before the floor sheets are locked to the copper. This holds the floor tight to the backing. The completed result is a floor without any seams or rough spots to catch the finely powdered milk, a floor which will carry traffic without movement, a floor easily kept clean. The photographs of the silo and room floors show the appearance.

As stated, 4X tin is used for the walls and ceilings. The application of the tin sheets is shown in the wall sketch and in the photographs. The in-



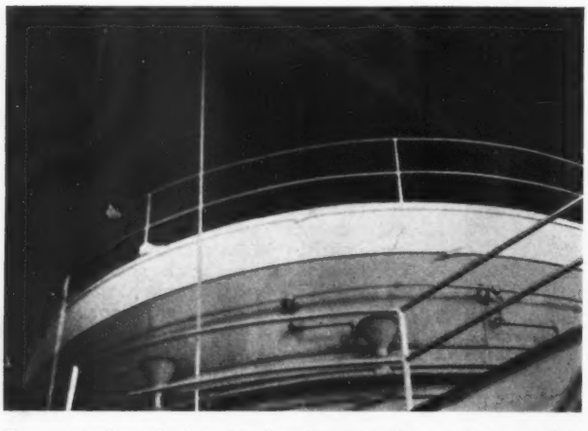
Above—Cross section showing construction of the floor. Note construction of joint between Allegheny Metal floor sheets using locking strip of copper, sweated in, and later scraped for smoothess. The sketch should show a nail driven through the copper strip into the wood floor.

Left—Tin-lined wall and ceiling showing size of sheets and nail rows. A detail on the following page shows wall construction. The holes are ports through which the liquid milk is blown.



Black iron air pre-heater and air ducts. Air from outdoors passes around tubes through which the warm silo air is sucked by a blower thus raising incoming air temperature and reducing heating costs.

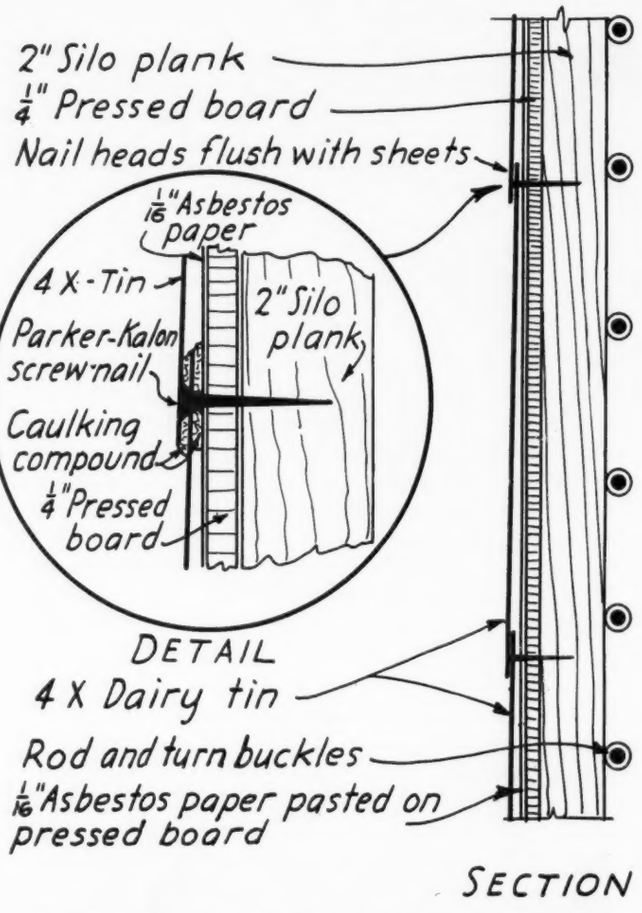
side surfaces of the silo planks are covered with a complete layer of ¼-inch pressed wood to smooth out all chords formed by the plank edges. Over the pressed wood a layer of $\frac{1}{16}$-inch asbestos paper is pasted tight as a backing for the tin. Beginning at the bottom of the wall a row of tin sheets is placed with caulking applied at all edges as shown in the enlarged cross section. The second row of sheets is lapped over the first row with another band of caulking compound between the lap of the sheet rows. Plain, flat headed (not slotted) screw nails are driven through the two sheets of tin and into the silo plank at very close intervals and far enough to give a flush surface. The photographs show the rows of nails clearly.



Top, exterior of silo showing liquid milk nozzles and drip drains.

Ceiling Construction

The ceiling of the silo is applied similarly to the walls, but the ceiling of the rooms is laid with open joints one way to make an exit for air pressure. The paste used for the asbestos paper is chemically treated against decay and molding and the caulking compound is non-poisonous. The heated air stack, which shows in the photographs is made of tin on a backing similar to the silo walls.

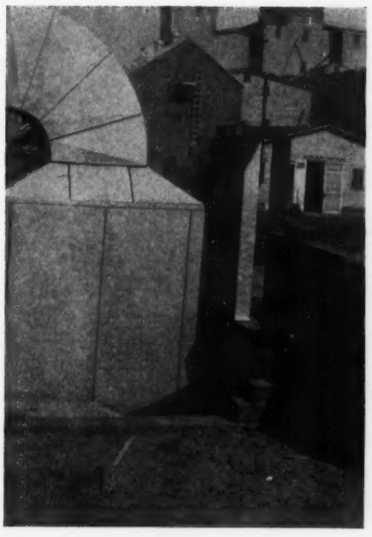


Sketch of silo wall construction with enlarged detail of joint. The lap (both horizontally and vertically) is caulked as shown and nails are driven with heads flush to eliminate any powdered milk "pockets."

Air Tempering System

As an economy feature of the plant photographed, the air from the silo (still warm) is sucked through a fan system into a pre-heater unit and serves to raise the temperature of the outside air which is used for the warm air supply. The pre-heater and some portion of the air supply system show in one of the photographs. This system was installed by the Brenner company.

The installation pictured required approximately 2,000 pounds of 24-gauge Allegheny metal and 75 squares of 4X dairy tin.



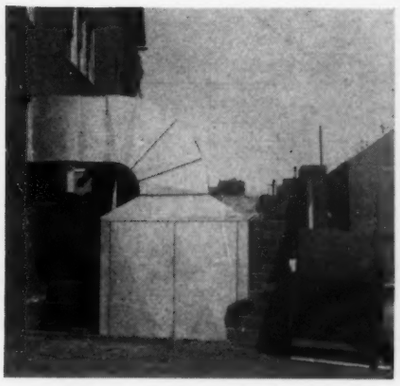


Fig. 9—Left—Furnace set and cased; stoker ready for setting. Fig. 10—Center—Ready to move blower into place. Fig. 11—Right—Finished furnace room.

Designing A Seed Corn Drier [Part 3]

By Alfred R. Wagstaff

Engineer, Sioux City Fdy. and Boiler Co.

Sioux City, Iowa

TO determine the Btu. requirement of a drier of any given capacity, multiply the square feet of floor area of all bins by 2,000. The resulting figure is the Btu. per hour required for heating the necessary air.[1] This is a short cut method and will give ample heat for the necessary drying. If the engineer laying out the drier is used to figuring air, the drier can be laid out from the amount of moisture to be evaporated and carried away. The following data are not really representative of the drying capacity of a stoker, but are given here as the data were recorded:

Stoker Action

No.	Date	Capacity	Set at	Min. on	Min. off	Bins Drying	% of time operating	Lbs. Coal per hr.
3	10/18	50 lb.	4	18	3	5	85.7	37.5
4	10/24	50 lb.	4	10	4	4	71.4	31.24
5	10/18	100 lb.	3	7	3	6	70.0	52.5
6	10/24	100 lb.	3	5½	4	5	57.9	43.4

(continuation of above)

No.	Floor Area of bins sq. ft.	Average drying time, hours	Moisture content of corn	Btu Required (by rule)	Btu Furnished by stoker
3	262.5	36.4	27.1	525,000	367,500
4	210.0	35.2	23.0	420,000	306,740
5	243.0	38.2	26.5	486,000	342,500
6	215.0	35.0	23.6	430,000	425,040

There is a divergence of opinion as to the amount of air necessary to dry the corn, but most men agree on 60 cubic feet per minute per square foot of floor space sufficient to carry off the moisture. Tests were made in the supply ducts with a pitot tube with the following results:

South Drier:

Velocity average 9 readings = 0.10 WG and corrected to 70° = a volume of 17,026 cfm.

Drying area of 6 bins = 245 square feet.

17,026/245 = 69 cfm. per square foot of bin area.

Velocity average 9 readings = 0.12 WG and corrected to 70° = a volume of 18,853 cfm.

Drying area of 5 bins = 190.3 square feet.

18,853/190.3 = 99 cfm. per square foot of bin area.

North Drier:

Velocity average 9 readings = 0.1144 WG and corrected to 70° = a volume of 17,555 cfm.

Drying area of 5 bins = 262.5 square feet.

17,555/262.5 = 64 cfm. per square foot of bin area.

Velocity average 9 readings = 0.1093 WG and corrected to 70° = a volume of 16,590 cfm.

Drying area of 4 bins = 210 square feet.

16,590/210 = 76 cfm. per square foot of bin area.

Some are of the opinion that 25% is enough fresh air to admit while others state that 50% should be recirculated. Of course this all depends on the relative humidity of the return air which should be checked frequently. When the relative humidity of the return air is too high the drying is slowed down. If the humidity is low it is better to recirculate more air as it takes less heat to raise the air temperature. A test was made at the fresh air intake of the South drier with a velometer with the following result:

Area of fresh air intake = 12.05 sq. ft.

Velometer reading = 628 fpm., average 9 readings.

628 × 12.05 = 7,565 cfm. of fresh air being drawn in.

Percentage of fresh air 7,566/19,307 = 39%.

The number of bins in a drier depends on the amount of ear corn to be dried. The drying season is from six to ten weeks. In laying out a drier,

there should be more bins than those in actual operation to allow for filling, the number of extra bins depending on how fast the corn is to be handled. With a ten bin drier the bins in operation at the same time will average from 50% to 70% continuous from the start. The number of bins being dried at one time varies from day to day and so it is imperative that the humidity of the return air be watched very closely to obtain the best results.

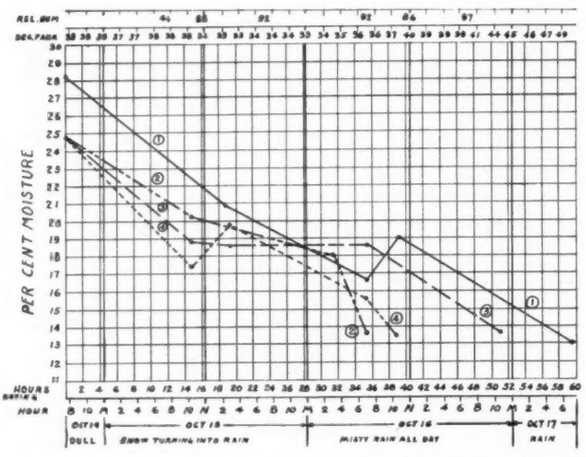


Fig. 18—Drying tests in North drier during weather of high humidity. The rise in moisture content in tests 1, 3, 4 indicate moisture pickup, due to dumping return air into furnace room and recirculating the mixture.

The advantage of using controlled air system over the other type is plainly shown in the two sets of curves of bins started at the same time, Figs. 18 and 19. The curves for the multi-bladed blower with the air emptying into the furnace room and mixing with whatever fresh air entered the door or window, Fig. 18, shows the effect of recirculating and picking up moist air and of the small size of stoker and furnace. In three of the bins there is a moisture pick-up due to the high relative humidity out of doors and the system not exhausting the humid return air.

In the South drier with the controlled air, Fig. 19, the drying time is extended over a longer period of time because of higher moisture content of corn at the start of drying, but this does not show any moisture pick up because of constant pressure with the backward curved bladed blower and a larger stoker to supply plenty of heat. Another comparison of the drying between the North drier and the South drier is shown in the following:

Moisture content of corn	North Drier Average Drying time	South Drier Average Drying time
28.2%	62 hours	38 hours
26.2	39 hours	35 hours
26.0	41 hours	34 hours
20.5	31½ hours	20 hours

The curves in Fig. 20 show the effect of controlling the humidity in the return air in the South drier. Curves 1 and 2 are of bins which were dried before any attention was paid to controlling the return air. Curves 3 and 4 are of approximately the same moisture content corn and show what can be done when the humidity in the return air is watched and corrected.

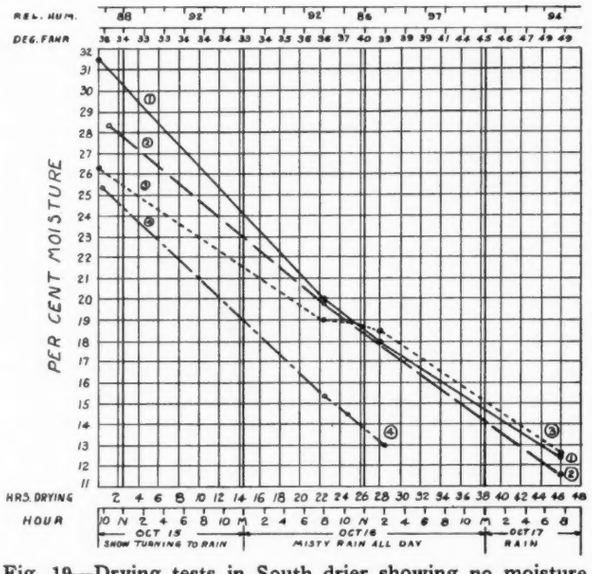


Fig. 19—Drying tests in South drier showing no moisture pickup. Humidity could be controlled. Also there is a larger stoker, more heat and a positive fan pressure.

The time required for drying corn depends primarily on the following: initial moisture content, speed of air through the corn, temperature and moisture content of the drying air.[1] During the drying season, at various times, 164 individual bin tests were recorded. This, of course, is only a small number compared with the number of times the bins were used, but is a good index of the operation of each drier. Average curves for drying are shown in Fig. 21. Curves 1 and 2 are of the North drier and 3 and 4 are of the South drier. In the North drier a bin of 33.6% corn was dried to 13.8% in 46½ hours while another bin of 33.2% corn was dried to 13.6% in 83¼ hours. With this are three bins of 32.0% corn, the first being dried to 13.5% in 45½ hours, the second to 12.4% in 44½ hours and the third to 13.9% in 46½ hours. Contrast this with three bins of 23.4% corn, the first was dried to 13.8% in 46½ hours, the second to 12.8% in 29 hours and the

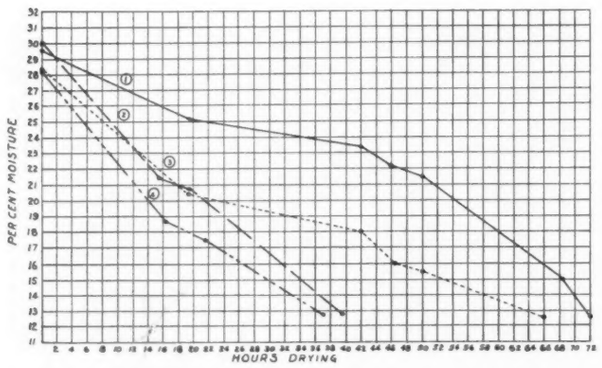


Fig. 20—Showing drying times in hours for two tests before and two tests after controlling humidity percentage in the return air. Humidity control pays.

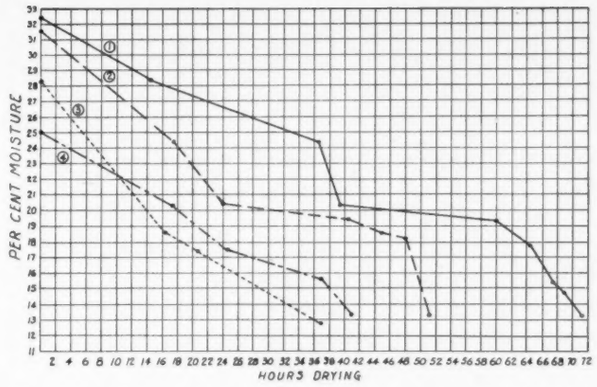


Fig. 21—Average drying curves in hours for North drier (curves 1 and 2) and South drier (curves 3 and 4) plotted from 164 separate tests.

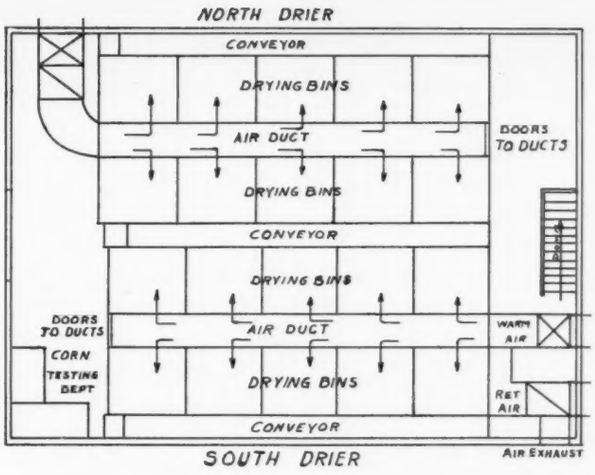


Fig. 22—Layout of two driers (North and South) described in this report.

third to 13.4% in 24¾ hours. The South drier did not dry so much more rapidly on the higher moisture content ear corn as it did the lower moisture corn in comparison with the North drier. For instance, a bin of 33.6% corn was dried to 12.4% in 38¾ hours; a bin of 31.9% corn dried to 13.1% in 42½ hours. For the lower moisture content, three bins of 23.5% corn were dried as follows: one bin to 13.2% in the 24 hours, one bin to 13.5% in 16¾ hours and the third bin to 13.2% in 13¼ hours. In as much as the higher moisture corn was received at the very beginning of the drying season before the personnel had become accustomed to tempering the air the comparison does not do justice to the driers.

The outdoor temperatures will not affect the drying of the corn. This will only have a tendency to make the stoker operate longer each time the thermostat calls for more heat. During the past drying season the coldest day had a maximum of 51° F. and a minimum of 19° F. and the warmest day had a maximum of 95° F. and a minimum of 65° F.

A complete layout of the two driers with the conveyors for unloading the bins is shown in Fig. 22.

From the foregoing it is evident that in order to successfully design a seed corn drier using the bin method of drying, it is essential that you

1—Install a furnace larger than actually necessary for the actual drying.

2—Correctly size the main air ducts.

3—Install reversing dampers so that constant control can be had of the air at all times.

4—Install a blower of ample size with positive pressure such as that obtained with the backward curved bladed blower.

5—Construct the bins air tight.

6—Have constant temperature in the main ducts at all times as obtained with automatic equipment.

The following short rules will size the furnace and blower which will be ample for the drier:

1. Cfm. of blower = Square feet of bin area × 60 at 1½" SP.[1]
2. Square feet of bin area × 2,000 = Btu. per hour of furnace, and if stoker is used, 15% less.[1]
3. Cubic feet per minute × 35 = Btu. required per hour.[2]
4. Cfm in thousands × 5.3 = pounds of fuel required per hour.[2]
5. Cubic feet capacity of bins/3.5 = bushel capacity of drier.
6. Furnace casing should be 15% greater than provided in standard furnaces.[1]

Heating Costs for Temperatures Above 70°

IT is rather common knowledge that indoor temperatures above 70 degrees mean additional heating costs regardless of the kind of fuel used. The extent of these increased costs, however, is not so well understood and, where the owner complains of high costs, it may pay to investigate the maintained temperatures before alterations of the heating equipment are undertaken.

Some interesting figures bearing on increased costs as temperatures are raised were published several years ago. How accurate these figures are, we do not know, but the compilation was made from tests of oil burning equipment and are probably a safe guide to show to a home owner.

Temperatures		Cost
68 degrees	6.2%	less than 70°
69 degrees	3.1%	less than 70°
71 degrees	3.1%	more than 70°
72 degrees	6.2%	more than 70°
73 degrees	9.4%	more than 70°
74 degrees	12.5%	more than 70°
75 degrees	15.6%	more than 70°
76 degrees	18.7%	more than 70°
77 degrees	21.9%	more than 70°
78 degrees	25.0%	more than 70°
79 degrees	28.0%	more than 70°
80 degrees	31.0%	more than 70°

Short Cut Pattern for a

Shanty Top or Roof Jack*

A reader in Pennsylvania, writes: "We make a number of so-called shanty tops or roof jacks in 4" to 10" sizes for farmers, contractors, etc., and as roof pitch varies and cost is a factor, we find it prohibitive to draft a separate pattern. Is there such a thing as a universal pattern or a firm making a universal base at a low price? Or, can some reader give us an easy, quick, short cut for same."

By William Neubecker

Head Instructor

Sheet Metal Department, New York Trade School

◆

IN WORK of this kind, where the pipe sizes and pitches vary, a short, quick, practical rule can be used known as the "water level." No drawing or lay-out is necessary, only a water tight pan of the required size to accommodate the desired diameter of the pipe and of sufficient depth to accommodate the angle of the pitch. A short sliding table is also required which can be made of slats of wood or of sheet metal.

Finding the Roof Pitch

Sometimes an order will come in, say, for a 10-inch pipe on a one-third pitch roof. Some mechanics may not know how to find the proper angle for this one-third pitch so to make this perfectly clear Fig. 1 in the accompanying illustration has been prepared. Fig. 1 shows how to find the proper angles for one-fifth, one-fourth, one-third, one-half or any other pitch.

The rule to follow is to divide the span of the rafters by the pitch number. For example, to find the proper angle for a one-third pitch roof, take any number (say 15) as shown in Fig. 1, divide this by the pitch number or 3 and the rise will be 5 inches, and *a-e-i* will be the desired pitch and angle.

The number 15 has been used to obtain the angles of ⅕, ¼, ⅓ and ½ pitches whose rises are respectively indicated by 3, 3¾, 5 and 7½. In other words

$$\frac{15}{3} = 5;\ \frac{15}{4} = 3\tfrac{3}{4};\ \frac{15}{3} = 5 \text{ and } \frac{15}{2} = 7\tfrac{1}{2}.$$

Any other number could be used—as for example

$\frac{10}{5} = 2$, rise for ⅕ pitch; $\frac{12}{4} = 3$, rise for ¼ pitch;

$\frac{18}{3} = 6$, rise for ⅓ pitch and $\frac{16}{2} = 8$, rise for ⅕ pitch.

Finding the Miter Cut

Knowing the proper angle or pitch of roof, this labor and time saving device shown in Fig. 2 is used as follows: Fill the pan up to the brim with slightly colored water, using water color powder. Slide the table flush with the top of the pan as shown. Assuming that the pipe is to fit on a roof of one-third pitch, cut a metal angle as indicated by *a-b-c* in the elevation of a ⅓ pitch roof shown at the upper left. Tack this metal angle with solder opposite the seam line of the pipe as shown by *a°-b°-c°* in Fig. 2. This is done so that when the pipe is in position, the seam will be opposite to the run of the water down the roof.

Now have the bottom line of the angle as *a°-c°* flush with the sliding table, slowly immerse the end of the pipe in the colored water as shown in the cut and avoid splashing the water so as to obtain a true miter cut. Leave the pipe in the water a minute or so, remove slowly, dry over heat, and the colored line on the pipe will be the cutting line for a miter joint on a ⅓ pitch roof. In this way any miter cut for any pitch roof can be obtained.

If the pitch is not known, it can be obtained by using a bevel as shown in elevator at the upper left. Lay one leg of the bevel on the roof and raise the opposite leg until it is in a level position, using a small spirit level indicated by W. Measure the distance between the inner corners of the bevel legs, indicated by V. The bevel can now be closed and reopened in the shop to the distance V and the proper angle obtained as was done and is shown by *a-b-c*.

Short Cut for Flashing Sheet

Having obtained the true cut on the roof line, the flashing piece can be obtained in a quick manner as follows: Cut the desired flashing piece as shown by *L-M-N-O* above and to the right of Fig. 2. Set the miter cut of the pipe in the center of *L-M-N-O* and

(*Text continued on page* 42)

*All rights reserved.

Universal Rule For Developing Accurate Patterns For Roof Jacks or Shanty Tops Of Any Diameter

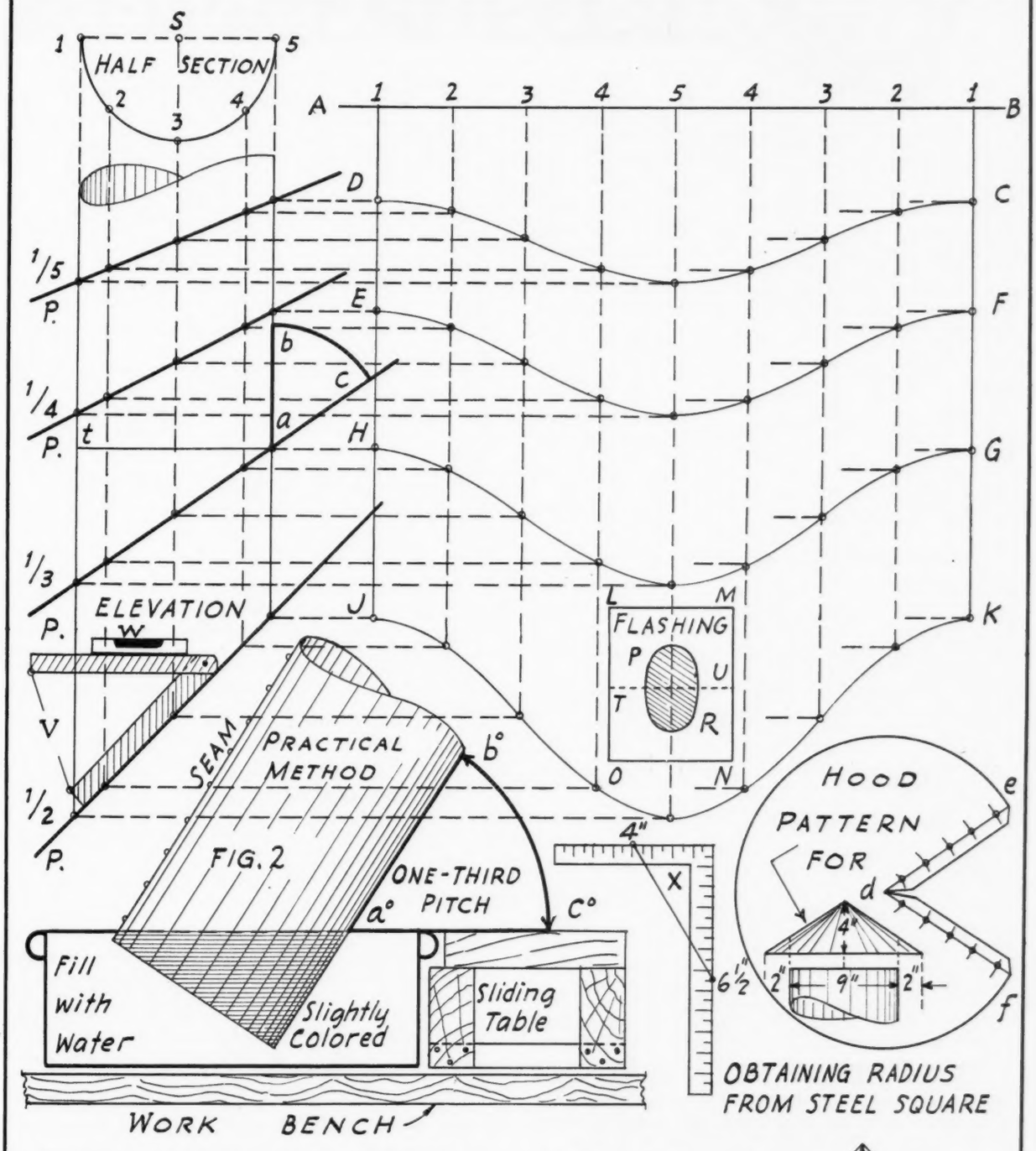
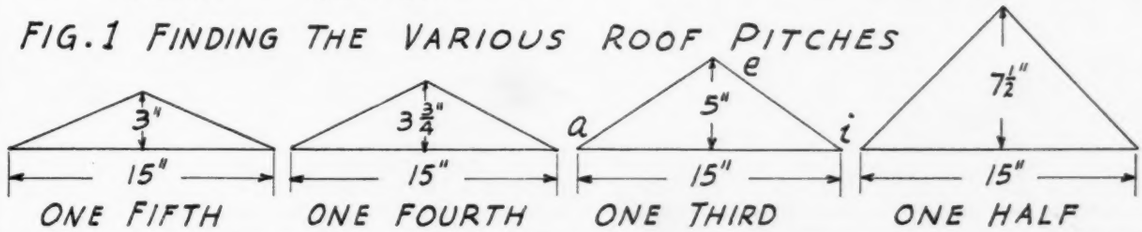
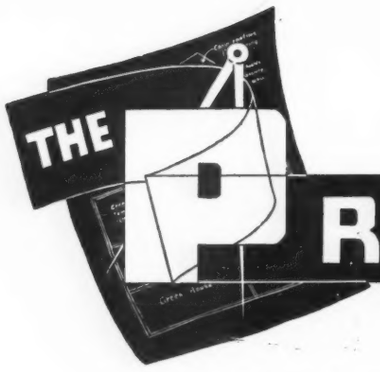


FIG. 1 FINDING THE VARIOUS ROOF PITCHES





Your comment or experience is invited.

PROBLEM CORNER

Radiator Hoist

American Artisan:

We would like to figure out some method for lifting the combustion dome and radiator sections into place using chain blocks or a hoist of some sort. We have not been able to figure out any simple way to hang chain blocks to floor joists, particularly in old houses where there is not very much clearance above the furnace. If any reader has worked out a piece of apparatus we would like to hear about it.

C. W. S., W. Va.

Reply by
The Editors

We have gone back through old issues of American Artisan but have not found any hoist fastening, or frame, or derrick. However, some reader may have a plan and we will present the problem in the Problem Corner.

(Has any reader such a piece of equipment or a method?)

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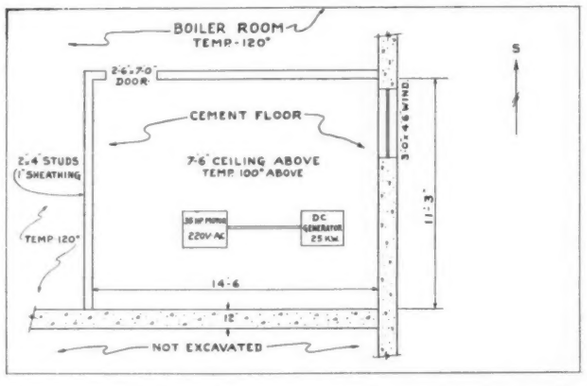
Cooling Converter Room

American Artisan:

I have enclosed a sketch of a room used for converting A. C. into D. C. It houses an A. C. motor and D. C. generator. This room gets very hot due to heat generated by motor and in adjoining rooms.

I plan to insulate the ceiling and partition, but the question is, how much of the heat generated by the motor will



have to be removed in order to keep the motor running cool enough. It shouldn't run over 150 deg. (the motor).

I would appreciate any information you could give me. Whether it can be kept cool enough by circulating outside air or if some mechanical means will have to be used.

C. F., Illinois.

Reply by
Prof. L. G. Miller
Michigan State College

Assuming that you are willing to allow the room, which houses the M.G. set, to remain at 120° F., no heat will enter from the boiler room with the present wall because of no temperature difference, hence no insulation required. The gain in heat from the set is 17,500 Btu per hour assuming the power generated by the generator is carried outside the room—loss through walls, floors, etc. estimated at 7,700, leaving 17,500 — 7,700 = 9,800 Btu per hour to carry out with ventilation air. When the temperature is 100° F outside it would require 450 cfm outside air brought in to keep the room at 120° F. Of course, when the outside temperature is lower, less air would do the job, and much of the time during cool weather, the fan would not need to run. I suggest the air be filtered and delivered against the M. G. set.

◆

Air Velocity Through Casing

American Artisan:

We would like to know the proper velocity of air over the heating elements of a furnace. We are told that 800 to 1,000 fpm is best, but our blower manufacturer tells us that we should not exceed 600 fpm. Naturally, this requires more free air passage and a larger blower. Can you give us proper data?

We would like, also, some information on Btu output per square foot of radiating surface, and cfm per Btu.

E. F. A., California.

Reply by
The Editors.

For information on the velocities of air through baffled casings when a fan is installed, we refer you to the Furblo Institute Bulletins (Bulletin 11) which gives a formula for free air space between furnace body and casing as follows:

Assume furnace body is 24 inches in diameter and casing 48 inches in diameter and volume of air to be circulated is 1700 cfm.

$$\frac{0.7854 \times (48^2 - 24^2)}{144} = 9.43 \text{ square feet}$$

which is a gravity flow of 180 ft. per minute $\left(\frac{1700 \text{ c.f.m.}}{9.43}\right)$

As baffled for fan application, 36 in. inner casing, the formula becomes

$$\frac{0.7854 \times (36^2 - 24^2)}{144} = 3.93 \text{ sq. ft.}$$

which gives an air velocity of 430 ft. per minute.

This bulletin goes on to say that there is no general agreement among engineers as to casing velocities and that checks of popular makes of furnaces indicate velocities from 300 to 800 ft. per minute, depending upon the particular type of furnace. In other words, a gravity type, top-round radiator will probably require velocities in the neighborhood of 400 ft. per minute, whereas special forced air furnaces with tubular or rectangular air passage may use upwards of 800 f. p. m.

The University of Illinois, in Bulletin 246, shows charts of volumes of air through casing, bonnet and register temperature capacities in Btu, with and without fan applications and while Bulletin 246 does not indicate either the air passage area of the furnace tested or the velocities through the casing, the University undoubtedly has this data and you should be able to obtain it by writing to S. Konzo, 1108 West Stoughton St., Urbana, Illinois.

The Mechanical Warm Air Heating Code says—"In converting a gravity furnace to forced air place an inner liner so as to leave an air space equal in square inches to 0.45 times the total c.f.m.

Precalculated Engineering

Mr. G. A. Voorhees,
American Artisan:

Our class in forced air heating at Franklin University (Columbus, Ohio) has been tremendously interested in your articles on Precalculated Engineering. Following are several questions the class would like to have you answer:

1—What means do you recommend for calculating the loss through the floor over unexcavated spaces or rooms in basements closed off from the furnace by partitions?

2—What method do you recommend for obtaining the heat loss through the ceiling which is also the roof, as, for example, a sun porch?

3—What is the best method for calculating the heat loss for basement rooms that are to be heated, a recreation room, for example?

In comparing heat loss calculations by your simplified method with heat losses obtained from the new Technical Code, we find your losses to be consistently higher. The question arises, do you calculate infiltration on all windows, or where the room has two exposures, use the side having the greatest length of crack?

W. B. C., Ohio.

Reply by
G. A. Voorhees.

Infiltration is the answer, as you assume. The tables allow full infiltration at all windows which, obviously, cannot represent true conditions. But I believe the fourth article in the April issue clears up this misunderstanding.

Incidentally, I made up one set of such tables a year or two ago in which I had two tables for windows; one for transmission loss and one for infiltration. These tables gave more accurate results, but I finally decided that the tables as now being published are better for general use.

Frankly, I like to have heat losses figured "a little heavy" for the benefit of the many newcomers in the heating and winter air conditioning field. They haven't had enough practical experience in plant design to be able to detect errors in their final results.

For instance, I was in a heating contractor's office recently when one of his salesmen came in with a layout of a job he had just figured. The boss looked over the plan for a couple of minutes and said, "George, this 3" x 10" riser won't heat that big bed room."

The salesman looked confused and said, "Well, it figures out that way."

But it didn't. When the figures were checked it was found that the salesman had made a mistake—but he hadn't had enough experience to *notice* that his stack size for that particular room was inconsistent in comparison with dimensions of risers to other second floor rooms.

Unless reasonably ample safety factors are incorporated in the values given in the Precalculated Tables, the *inexperienced* user may occasionally find a "trouble job" on his hands—and trouble jobs cost money.

As to your question about transmission losses through floors to unexcavated and unheated spaces below, it's a wild gamble whether you estimate such losses correctly even by using the most accurate methods of calculation. In the case of a house already built, if the designer of the plant can examine the building and if he has had enough experience to enable him to make a reasonably accurate estimate of the air temperature in the unheated space, then by following the A.S.H.V.E. Guide, he can arrive at a fairly accurate estimate of the heat loss through the floor. But often you work from an architect's plan where you can only guess at the many variables which will affect the air temperature in the cold space. In other instances where the house is already built, the man who makes the calculations isn't the one who measures up the building and personally examines the construction—and again it's a matter of guess work.

Consequently, I suggest that the heat loss through such a floor be assumed to be the same as that given in Table 8 (February) for a cold ceiling with a tight floor above. For example, if the room is 10′ x 10′, Table 8 shows the loss to be 1.4 or 1,400 Btu per hour.

If it is assumed that the difference between room temperature and temperature in the unheated space is 35 degrees and that the floor consists of maple or oak flooring on yellow pine sub-flooring on joists with no insulation or other protection underneath ($U = 0.34$), the heat loss through the 10′ x 10′ floor will be $100 \times 35 \times 0.34 = 1{,}200$ Btu per hour (approx.). For single yellow pine floor ($U = 0.46$) it will be $100 \times 35 \times 0.46 = 1{,}600$ Btu per hour (approx.). So the tabular value (1,400) is not so far off; especially when we remember that the floor transmission loss is only one of the several losses which combine to give the total heat requirement of the room.

The loss through a roof such as that over a sun room may safely be taken from Table 8, using the column "No floor above and no insulation."

The question of basement rooms has bothered me considerably because of the range of variable factors involved such as temperature of the ground at various levels below the surface, relative area of exposed wall above and below ground surface, etc.

Several years ago in preparing the Furblo Institute Engineering Bulletin No. 17, I tried to arrive at a probable average ground temperature within five or six feet of the surface. During the several months spent in studying the problem with the helpful co-operation of the departments of Geology and of Soil Physics of several colleges and of the U. S. Geological Survey and the Weather Bureau, I reached the tentative conclusion that "the inside-outside temperature difference below grade will be 15 degrees less than one-half the inside-outside difference above grade."

Where precise calculations of heat requirements of basements are desired, I follow that rule. But I have hesitated to try to compile a precalculated table to give such heat losses—or rather, to try to compile one which I could feel safe in recommending for general use. I have worked up several such tables, but haven't yet found one that I'm satisfied with. The only advice I feel safe in giving is that you turn from the tables to the more precise calculation method where basement rooms are involved.

◆

Flux for Stainless Steel

American Artisan:

Will you please send us recommendations for a satisfactory flux to be used for stainless steel (soldering) and for aluminum welding using a torch?

C. W. S., Oregon.

Reply by
The Editors.

Attached are tear sheets of an article on soldering bright metal, which contains formulas for several solder fluxes.

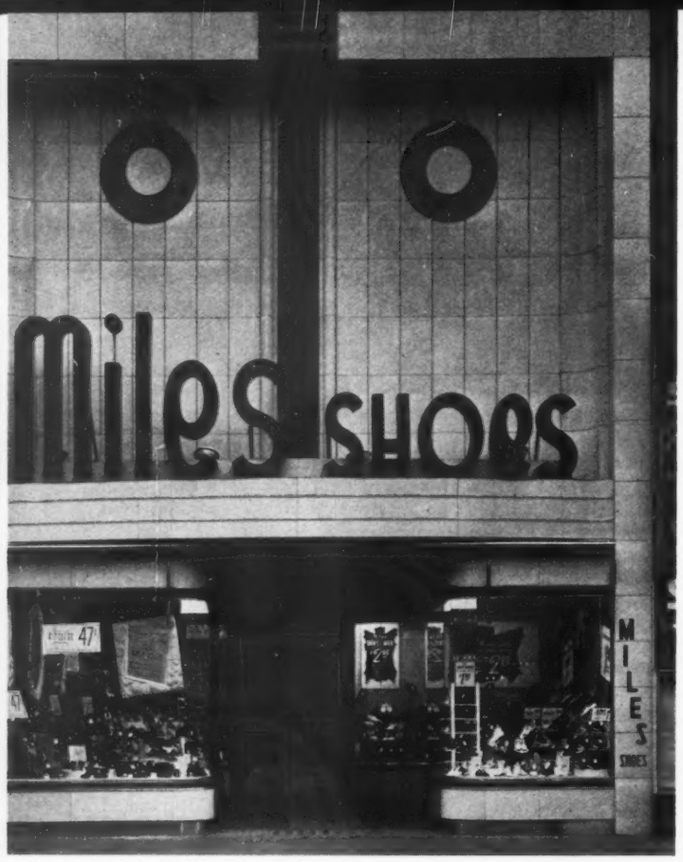
For a flux for soldering stainless steel, we suggest that you write to the manufacturer of the particular stainless steel you are using as each of the manufacturers has his own recommendations for fluxes and the manufacturers do not entirely agree on the flux composition. While we presume you are using standard 18-8 metal, the fluxes to be used with stainless steels of other compositions differ considerably from the flux for 18-8, so we suggest that you tell the manufacturer just what material you are using.

Generally speaking, the manufacturers recommend "All-Sol" manufactured by the L. B. Allen Co., 6727 Bryn Mawr Avenue, Chicago, or a cut acid flux composed of

Muriatic acid	90 parts
Ferric chloride	50 parts
Nitric acid	3 parts

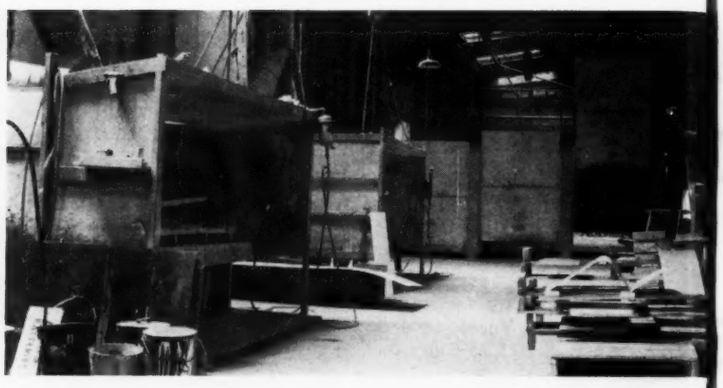
The flux should be allowed to remain on the surface for five to ten minutes and then washed off. After soldering, all flux remaining must be removed by washing with a ten percent solution of washing soda.

We attach a tear sheet from the October, 1936, issue, containing an article with the name of the flux and rod recommended for torch welding aluminum. You can get full details by writing the Linde Air Products Company, 30 E. 42nd St., New York City.



Left—Exterior of store described in the article showing appearance of type of application discussed.

Below—One of eight spray booths where the porcelain enamel is sprayed on sheets before baking. Both photos by Porcelain Metals, Inc., enamelers.



Porcelain Enamel Steel

By R. C. Nason

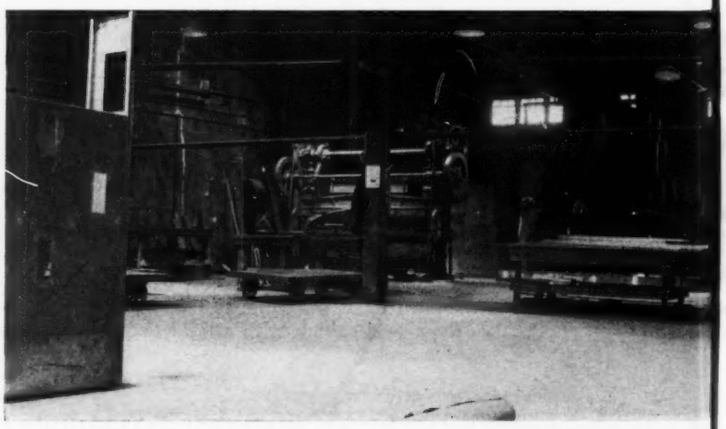
A RECENTLY enacted New York City regulation making it prohibitive to use glass blocks at building levels greater than 15 feet above ground has served to increase the use of sheet metal, particularly for store fronts and building facings. And this increased use of forms of sheet metal has in turn, served to focus the attention of the whole industry on store front metal application, a disregarded activity of the sheet metal industry.

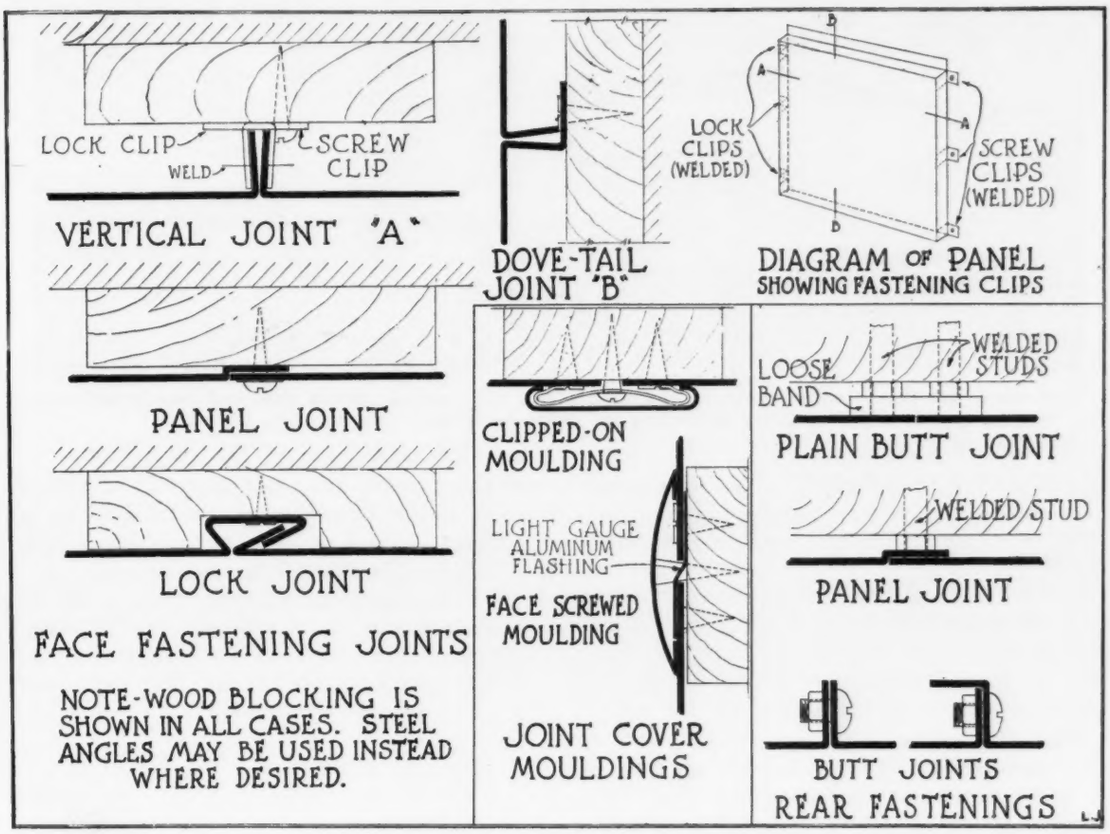
Among prominent materials now favored is enameled porcelain steel of 16 gauge. Sheet metal contractors have fabricated and installed literally hundreds of building fronts of this material during the past nine months and find demand brisk at this time.

For example, the recently installed front of the Miles Shoe Co. store, Brooklyn, N. Y., here shown, was installed by Tall & Franklin Co., of New York City. There were 1½ tons of 16-gauge enameled steel used here. But perhaps of greater importance was the skill and equipment required by the sheet metal contractors before the 24 in. x 30 in. steel panels could be permanently attached to the building.

Due to the concave curvature noted behind the store's sign, panels had to be shaped, together with their lugs, or clips, before the base metal could be

Above—One of the bake ovens with loading cars where sprayed sheets are baked. Below—Sheet metal shop where special shapes can quickly be made up on order. Both pictures taken in plant of Porcelain Metals, Inc., Long Island City, N. Y.





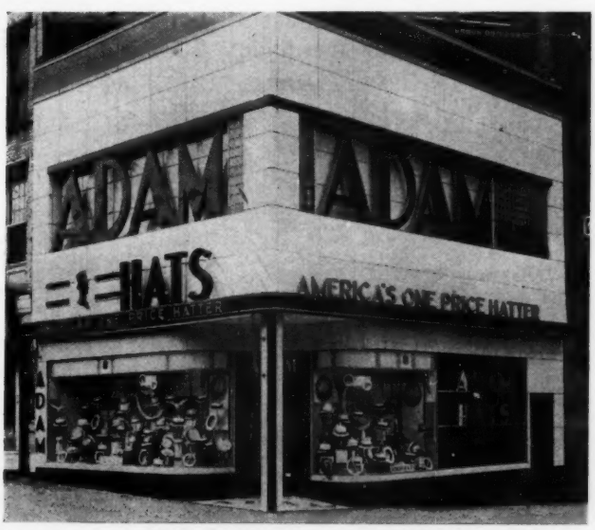
Some customary methods of fastening porcelain enameled sheets in place, showing several types of joints, joint covers and panel locks. From literature of Poreclain Metals, Inc.

enameled. This called for considerable accuracy.

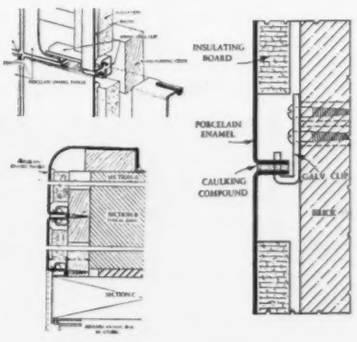
Although there are several approved methods of attachment that might have been used in this case, what is known as the "pan and lug" system appeared to promise greatest satisfaction. Under this method, Porcelain Metals, Inc., Long Island City, N. Y., who did the enameling welded lugs to each side of all panels before baking on the porcelain.

Tall & Franklin Co., in applying panels to a ⅞-in. wooden backer that covered the entire area concerned, fastened first an end panel in place by screws through lugs, or clips. The edge of adjacent panels then were interlocked under the edges of first panels, the other sides of "second" panels then being screwed to the backer as was done with "first" panels. So the work progressed until the entire store front received its metal armoring.

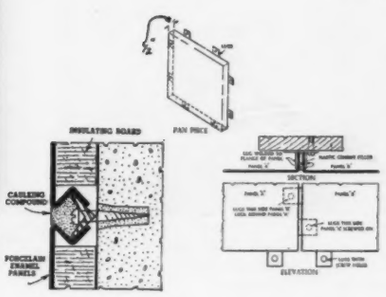
Joints between panels were filled with mastic, although sometimes such sealing is omitted due to



Plain faced, enameled porcelain panels with contrasting trim on a remodeled retail store. Enameling and photo by The Enamel Products Co., Cleveland.



Extreme right—Hanging Hook system, with panel edges turned back ½ inch and slotted. Joints are about ⅛-inch filled with mastic. Inside, right, Spring Clip system showing special clips and indented edge of panel.



Extreme left — Vee Clamp system showing formation of panel edges and screw held clamp. Inside diagrams — Pan and Lug system. Lugs are welded to sides of panel before enameling. After the first panel is fastened by screws through the lugs the adjoining panel is interlocked under the edge.

One story, "tax-payer" with exterior of enameled sheets with special cornice trim and coping and dark panels under windows. Enameling and photo by Enamel Products Co., Cleveland.

closeness of abutting panel edges. The lug method is one commonly used on remodeling work, as was the condition in connection with the Brooklyn Miles Shoe Co. store.

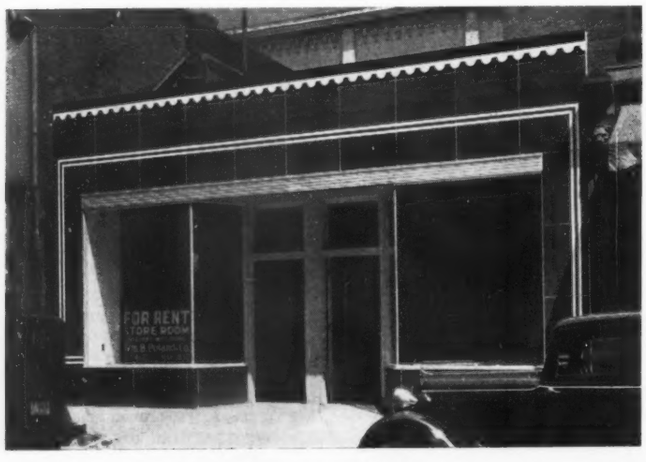
Contractor J. Tall, of Tall & Franklin Co., in discussing work handled by his company, pointed out that in remodeling jobs of this type it is their custom first to level irregular construction surfaces with wood or metal furring strips located where panel joints are to be. This is usually 24 in. on centers vertically and 30 in. on centers for lateral furring. Lag screws, Rawl plugs, Parker-Kalon expansion screws all have been used successfully for attaching furring to construction. Not infrequently solid wooden backers also are used, this when owners require a real solid and expert job and do not mind the extra cost.

Not infrequently, also, they use the Revecon system of Rever Copper & Brass, Inc., wherein extruded aluminum framing receives and supports panels securely. Then, Tall & Franklin Co. sometimes favor the use of steel frames, particularly for small buildings such as gas stations and food stands. When the interlocking panel systems are used, emphasized Mr. Tall, the starting points and end points must be determined for the fastening of the panels to the supporting structure. In remodeling work where custom fitting is involved, as, for example, in the case of the shoe store front shown, each panel should be numbered on the drawing and this number marked on the back of the panels before they leave the enamelers.

On certain types of construction, the caulking operation can be simplified by "buttering" the flanges of the panels with a knife-grade compound. When panels are set in place the excess compound is squeezed out and can be trimmed off with a tuck-pointing tool.

Referring, again, to the Miles shoe store installation already mentioned, this work was what is commonly known as panshaped contour. Only 16 gauge sheet metal was used throughout. The large sign seen, made by another contractor, has raised letters the sides of which extend straight back 6 inches. Except for backs, letters are enclosed. The finished sign was supported behind by porcelain enameled ordinary ¾-in. pipes flattened at their ends for bolting attachment.

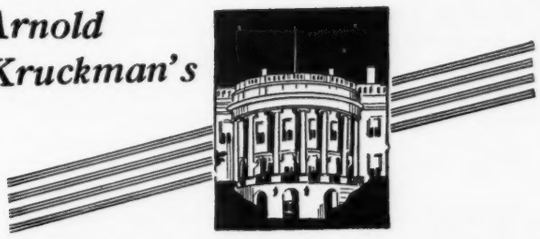
The smaller vertical letters noted at the sides were stenciled on by the enameler. The background color combination is ivory and terra cotta. The large targets seen are 5 feet in diameter and raised 5 inches. They have brown rims and ivory centers. Flood lights were installed for night illumination. Although the facia, or upper part, of the assembled front is 25 feet wide by 20 feet high, the entire front is 25 feet wide by 30 feet high.



Striking remodeled store front with black and white contrasted in background and trim. Enameling and photo by Porcelain Enamel Co., Cincinnati.

Porcelain enameled panels applied over cinder block using Revecon (Revere Copper & Brass Co.) sections for trim. Revecon sections also used for glazing. Enameler—Erie Enameling Co., Erie, Pa. Photo by Revere Copper & Brass, Inc.

Arnold Kruckman's



Washington Letter

The Wage-Hours Law

THE Wage-Hours Law applies to business that is "in the stream of interstate commerce." The Federal Government, under the Constitution, received from the States the power to regulate the transactions between the States. Therefore, first, it is important to understand exactly what is regarded as coming under the supervision of the Federal Government in "the stream of interstate commerce."

Although few industrialists, and even very few lawyers, have much knowledge about the so-called Santa Cruz Fruit Packing Company decision, published on March 28, 1938, it is supposed to have revolutionized the conception of interstate commerce, in the opinions of Federal officials.

Santa Cruz Test Case

The Santa Cruz Fruit Packing Company is located in California. It contested an order by the National Labor Relations Board regulating its relations with its employees. It denied that it is in interstate commerce. The U. S. Supreme Court ruled that goods—or services—delivered f.o.b. or c.i.f., within the State of their origin and subsequently *distributed by other parties* beyond the boundaries of the original State, move "in the stream of interstate commerce." Moreover, the implication of the decision is that this principle applies to every relation that is concerned with the welfare of the nation, social or economic, meaning of course that it applies to workers, and the effect upon the life of workers, as well as the goods they produce, or the services they render. Under this decision the goods you sell, or the job you perform solely in one State, comes under the regulation of the Federal Government if the goods or services compete with those from another State. In the past Federal jurisdiction was limited to control of misbranding and unfair trade practices. This decision gives the Federal Government sweeping police powers over all interstate social and economic practices.

Who Is in Interstate Commerce?

Although you may be ignorant of the destination of the fruits of your labors, the Law now holds you are competing "in interstate commerce" when others *whom you may not know* make profits by means of your products in other States in competition with those who sell similar wares or services. The U. S. Supreme Court further cinched the application of the doctrine by ruling that the Law applied even though the Santa Cruz Fruit Packing Company obtained all its raw materials in California, manufactured them in California, and sold and delivered them within California. Finally, the Court ruled, although only a fraction of a percent of the total business may be an interstate transaction, no matter how negligible the actual quantity that eventually found its way into interstate commerce, the fact that any interstate commerce resulted (regardless of quantity, value, bulk, or number of persons actually employed upon that fraction which passed into the stream of interstate commerce) was sufficient grounds for bringing an industry under Federal regulation.

The Wage-Hours Law specifically exempts "any employee engaged in any retail or service establishment the greater part of whose selling or servicing is intrastate." This clause apparently was hastily written. The Wage-Hours Administrator himself does not know whether the word "whose" refers to the establishment or to the employee. The application of the word to the business or the person makes considerable difference. The Courts, eventually, will have to guess what the Congress meant when it enacted the clause. The clause as a whole obviously is in conflict with the Santa Cruz Fruit Packing Company decision. That ruling said and meant specifically that *any* interstate transactions, direct or indirect, make the whole business interstate. The Administrator has said that he thinks any business which does a volume of more than 20% commerce outside of the home State is in interstate commerce. On the other hand, the Federal Trade Commission considers any retail establishment, sales or service, which sells *any part* of its goods or services beyond State lines, as being in interstate commerce. Department stores almost invariably are classified as being in interstate business. Mail order retail institutions, as well as wholesale units, are entirely in interstate commerce. Many other stores, shops, works, service organizations, usually deemed as local, by reason of the small fraction of business they may do outside of their own States, become amenable to interstate Federal regulation.

Rulings Within the Law

The Administrator has promulgated a considerable number of definitions and interpretations of the Law. These pronouncements are, in effect, regulations authorized under the Law. Most of these declarations are essentially the same as the original Act, in words and meaning. It is Mr. Magruder's idea that industry should make its own interpretations, and if its definitions appear open to question, the Government or the industry can clarify uncertainties in the Courts. Among the regulations are those applicable to the employment of handicapped persons on terms outside of the Wage-Hours Law; substandard wages applicable to messengers; substandard wages applicable to learners; regulations for retail exemptions, for "outside" salesmen, for "professional" employees; and regulations for the procedure of Industry Committees and for the exemption of Executives and Administrators. These regulations have been published and, together with other publications, may be secured from the Wage-Hours Division, Department of Labor, Washington, D. C. By the time this is published another circular will be available defining seasonal labor.

Workers Definitely Included

At this time the details of the Wage-Hours Law are confused and foggy. Roughly, Administrator Andrews has estimated the Law at this time applies to 12,000,000 to 15,000,000 persons. The wage minima has a limited application only where there is unskilled labor. The hours maxima applies to EVERY industry and business in interstate commerce. ALL workers, no matter what salaries or wages they receive, except a limited number of special classes such as sailors, farm workers, railroaders, administrative, executive, and professional workers, may work only 44 hours per week the first year, 42 hours per week the second year, and 40 hours per week thereafter. Office workers, janitors, watchmen, and other custodial workers, come under the Law. Professional workers, and probably technicians and artisans, will be classified as workers, selling Time, rather than as experts taking on specific tasks. Those employed on piecework must work on an equivalent of the fixed weekwork. Lawyers, accountants, chemists, engineers, and similar workers, employed by the week, month, or year, on salaries, apparently will be classified as workers, not as professionals. When they work overtime, they must be paid time and a half. This applies to the man who draws an annual salary of $25,000 per year as well as the lowest paid wage earner. Employers must keep comprehensive records of the history of each employee.

Violation Angles

If any part of the Law is violated, either employee or competitor may instigate action to arrest the sale of products; to prohibit jobbers and distributors from handling such products; and such producers may be fined $10,000, six months in jail, or both. Each employee who has received substandard wages may collect damages, double the wages due, plus costs, and plus attorneys' fees. If you use machinery, or parts, or materials, not made in compliance with the Law—Section 15—you are just as criminally guilty as the original offender. For instance, if you place a label on a package, and the label is printed with ink manufactured illegally, you will be held liable exactly as the original ink-manufacturer is liable. And the same responsibility attaches to the printer, the jobber who sold you the labels, and those to whom you may sell the package bearing the label. To avoid this situation, demand a certificate from those from whom you buy that they have complied with the Law. Your customers may expect the same guarantee from you.

Industry Committees

The unique institution of the new Division is the Industry Committee, mandatory by Law. It may represent several parts of an industry or an entire industry. Broadly, the function of an Industry Committee is designed to fix fair labor standards and pay. Administrator Andrews hopes to limit the average Committee to nine members, three to represent the Public, three the Workers, and three the Employer-Management. If the Law does not effectively do so, it is expected we will have another Law to limit profits, and another to limit the volume of production per worker, and to increase the use of manpower by limiting the use of machinery. Obviously price control, as well as control of profits, dividends, manager salaries and production costs, are objectives in the unfolding of these Committees.

The Wage-Hours Administrator has discretion in fixing wage minima, between 25c and 40c per hour. It is understood the 40c minima may become effective in most industries immediately.

Meanwhile, Madame Perkins energetically fosters a drive to persuade all States to make a Wage-Hours Law patterned after the Federal Law. She furnishes a model for consideration upon request.

Silver Soldering Copper Plate Vessels

Silver soldering, not familiar to many shops, meets the need for a joint mid-way between a soft-soldered joint and a joint made by welding or brazing. This article explains a method using the oxy-acetylene flame and proper holding jigs.

HARD-SOLDERED or silver-soldered joints have been found to fill a very definite place in the industrial world. Since the use of the oxy-acetylene blowpipe for making this type of joint has increased considerably during the past three or four years, this method of production should be understood by all who fabricate or repair metal products.

Silver-soldering has been used for years in the manufacture of silver plate and jewelry. Primarily it was so used to make possible a strong joint of the same color as the base material. It has been only during the past few years that many industrial uses have been developed.

Hard solders are now made that are resistant to many types of corrosion. Furthermore, the process is ideal for certain applications because the melting point range of hard solders is about midway between that of ordinary solder and that of bronze welding rod. For instance, for work where a relatively low heat is necessary, the bronze-welding temperature may be too high for making the desired joint. Likewise, where the corrosive agent that comes in contact with the joint attacks bronze the hard-soldered joint may be resistant. Thus the process offers a valuable supplement to bronze-welding.

There is some variation in the composition of the

generally used silver solders. Melting points range from about 1300 deg. F. to over 1500 deg. F.; color from yellow to white; strengths from 40,000 to 60,000 lb. per sq. in.; ductility from about 5 per cent in 2 in. to over 35 per cent; and electrical conductivity from about 15 per cent to about 77 per cent that of copper. Therefore, it is possible to obtain almost any desired physical property in a joint, if the correct solder is used.

Flux is also essential in securing the best results. It is used to dissolve any oxide that may form on the surface of the metal when heated, to prevent atmospheric oxidation by covering the heating part, and to assist the "sweating" action of the solder. There are several good fluxes commercially available. A saturated solution of borax, which is most effectively applied with a brush, may be used. The parts to be joined as well as the soldering wire should be painted with the flux.

The oxy-acetylene flame best suited to light work is produced by a small size blowpipe tip. For heavier work, such as making sweat-type joints in larger diameter piping, a larger flame, one that will heat the work rapidly, is, of course, desirable. For very light objects the smallest available tip is advisable. In some cases where very low heat is desired an acetylene-air

Fig. 1—Silver soldering with the oxy-acetylene flame was used to fabricate these copper vessels.

flame may be found to be best. In general, a soft oxy-acetylene flame of a size to heat the work rapidly and thoroughly is recommended.

Procedure

The procedure for applying silver solder by the oxy-acetylene process is simple and in most cases offers advantages over other methods of application. Since any soldering operation is a surface phenomenon, the necessary penetration and "sweating" of the solder to the base metal can take place only on a thoroughly clean surface. Therefore, as in all soldering operations the parts to be joined must be thoroughly cleaned either chemically or mechanically. Furthermore, in silver-soldering, the edges or surfaces to be joined should be smooth and fit tightly. In a tight joint the thinnest film of solder is sufficient to make a strong bond. Loose joints mean using an excess of silver-solder which is a wasteful practice.

After the work is fluxed, it is heated to the proper temperature, taking care not to overheat the base metal. The flame is removed and the solder, also fluxed, is applied to the joint. It will melt and, due

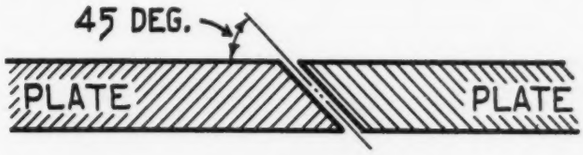


Fig. 2—The copper vessels used the joint preparation shown here.

to capillary attraction, will flow to all parts that have been properly cleaned and fluxed. With practice, the knack of heating to the right temperature is quickly developed. The flame should be applied only to the work—never to the wire or to the solder in the joint itself.

Under the oxy-acetylene flame silver solder flows so evenly that it penetrates quickly and deeply into all parts of the joint. The absence of pinholes and the complete capillary penetration make a firm, strong bond.

Uses Recently Developed

In the chemical and process field are found some of the most prominent uses for silver soldering work with the oxy-acetylene blowpipe. Of particular interest is the joining of non-ferrous piping by means of sweat-type fittings, in which, of course, resistance to certain types of corrosion is an important factor.

Silver solder is used for many of these joints where maximum corrosion problems are met at temperatures lower than the melting point of this solder. It is often found that ordinary solders cannot be used because of their low melting points and inability to resist corrosion. In cases of working temperatures higher than that which silver solder will stand, bronze is used as the bonding agent. For maximum temperatures, it is found that fusion welds meet the requirements.

The fabrication of eleven large copper process vessels is another interesting job recently reported. The fact that the seams in these tanks are longer than those in any job previously silver soldered by the oxy-acetylene process is of particular interest. Some method of having the copper plate edges meet in line instead of the usual lap type joint had to be devised. Accordingly the plate edges were machine beveled so that a 45 deg. lap joint was obtained as shown in the accompanying diagram. On some other equipment specifications a similar joint is used, but the lap is ½ in. to ¾ in. on one edge, with the seam jogged or offset.

The oxy-acetylene flame has been found ideal for this type of work because of the ease of local heat control, and the speed with which the joint can be brought to a sweating temperature. These types of fabrication are typical of a great deal of work that is being done at present in the chemical, process, and numerous other industries.

Lint Collector for a Mattress Factory

By J. W. Baybutt, Rochester, N. Y.

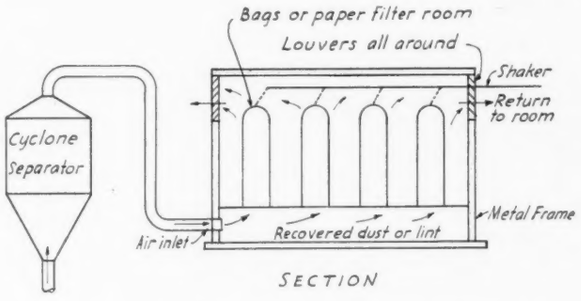
A READER of American Artisan writes that he is designing a dust collector or separator to be used in a mattress factory where the cotton lint or dust is very fine and the ordinary type of cyclone separator may not work satisfactorily.

There are at least two methods for separating or collecting the fine, light dust from such operations. If the quantity of such dust is very large, it is probable that a cyclone separator with an outlet to a bag room as shown in the sketch will meet all requirements. The air from the room or machines is taken first to the cyclone where the heavier materials are separated out of the air by the abrupt decrease in velocity within the cyclone.

The air, instead of being blown outdoors, can then be conducted from the cyclone to a bag or paper filter room or cabinet as shown. The air blows into the bags, distending them balloon-like and works through the bag walls leaving the dust or lint inside the bags. The bags should be large enough or of sufficient number so that the air velocity through each bag does not exceed 5 feet per minute. The dust falls to the chamber below the bags where it is shoveled out.

To get this low velocity through the bags it is necessary for the cyclone to be large so that the cyclone outlet velocity will be low.

If there is only a small amount of air and dust to handle, the cyclone can be dispensed with and the air from the room or machines brought directly to the bag room or cabinet. The same 5 feet per minute air velocity through the bags must be maintained. In some cases an air washer will clean the dust from the air.



In at least one installation, this dust laden air is sucked up by a fan and used to feed the power boiler draft fans.

Neubecker Pattern

(*Continued from page* 32)

mark the elliptical outline *P-R*. Allow for flange and cut out; or if the flashing is desired in two parts, cut through the center line *T-U* as shown dotted and allow for over lap.

Quick Layout for Shanty Cap

The laying out of the shanty cap pattern by a rapid, accurate method is shown at the right of Fig. 2. Assume the pipe is 9 inches in diameter and the hood or cap projects two inches all around, making the diameter of the cap 13 inches. Assume that the height of the cap to its apex is to be 4 inches all as shown in the diagram. The dimensions just mentioned need no drawing.

We know the height is 4 inches and that one-half of 13 is 6½ inches. Now use the steel square shown in diagram X and set the dividers from the 4-inch mark on one leg of the steel square to the 6½-inch mark on the other leg and using *d* in the hood pattern as center describe the circle shown. Find the circumference of the 13 inch base by 13×3.1416 and obtain 40.84 or say 41 inches, or use a table of areas and circumferences.

Now set the dividers equal to one inch and starting from any point in the hood pattern as *e* step off 41 spaces of one inch each to *f*. Draw the radial lines from *e* and *f* to the center or apex *d*, which is the net pattern. Allow for riveting lap as shown. Space the rivet holes along the line *e-d* and using *d* as a center draw arcs to intersect the opposite line *d-f* as shown. Any size of shanty cap may be made by this simple rule.

Geometrical Rule for Layout of Larger Pipes for Various Pitched Roofs

When large diameter pipes are required, a full size pattern chart can be laid out in spare time, to be used when wanted, similar to that shown at the top of the illustration.

The desired half section of the pipe is first drawn and below it various standard angles or pitches of roofs are drawn, as shown by ⅕, ¼, ⅓ and ½ pitches. The half section is spaced in equal divisions as shown by the small figures 1 to 5. Twice the girth of this half section is placed on the horizontal line *A-B* as shown from 1 to 5 to 1. From these small figures perpendicular lines are drawn and intersected by horizontal lines drawn from similar numbered intersections on the various roof pitches.

Lines traced through points so obtained will be the patterns or miter cuts for the four standard pitches. Thus 1-*D*-*C*-1 will be the miter cut for a one-fifth pitch roof, *E-F* the miter cut for a one-fourth pitch, *G-H* for a one-third pitch and *J-K* or a one-half pitch.

The same pitch lines in elevation can be used for any other diameter pipes, marking the intersection on the pitch lines with different colored pencils to avoid confusion in transferring points of intersection on the patterns. In this way the different half sections can be placed in a group using but one center point *S*. If desired the miter pattern can be laid out direct on the sheet metal, transferring the projections from a line drawn perpendicular to *a-b* in elevation as *a-t* for a one-third pitch. A chart of this kind can be laid out at leisure times, and will be handy when the patterns are wanted.

RESIDENTIAL AIR CONDITIONING SECTION

IN this issue (page 45) we conclude the Research Residence paper covering methods of securing greater comfort by reducing floor-ceiling temperature differences. Previous installments dealt with two-speed blower operation and intermittent cycling of the fan. The data reported have been of far-reaching importance.

Two interesting installations are reported in this month's section—one reporting fuel savings with a warm floor plenum system (page 54) and the other an installation made according to the Minneapolis Code (page 49).

A most interesting and valuable article on page 62 presents in tabular form the savings to be anticipated with such forms of heat conservation as a day-night thermostat, ceiling insulation, wall insulation, storm sash and weather-stripping.

We conclude John Kurtz's thesis on filtering and filters with a description of the testing apparatus and testing methods on page 57.

HOW "pre-heater" THERMOSTATS OPERATE

THE "Pre-heater" Thermostat was originated and developed to prevent overheating with the resulting waste of fuel and to prevent heat stratification with the attendant discomfort of "cold 70".

To accomplish this it was necessary to provide more frequent heating cycles of short duration. This operation is secured by locating a small "pre-heater" element close to the bi-metallic blade of the Thermostat. This element begins to heat up as soon as the thermostat makes the burner circuit. Its heat, plus the heat of the room, causes the blade to break the circuit before it otherwise would. All "pre-heater" thermostats, regardless of make, use this same principle.

The "Genuine Detroit" Two-Eleven Compensating Thermostat has the following exclusive advantages:

1. Not affected by differences of load in the main circuit because the "pre-heater" is in parallel with the load—not in series with it.

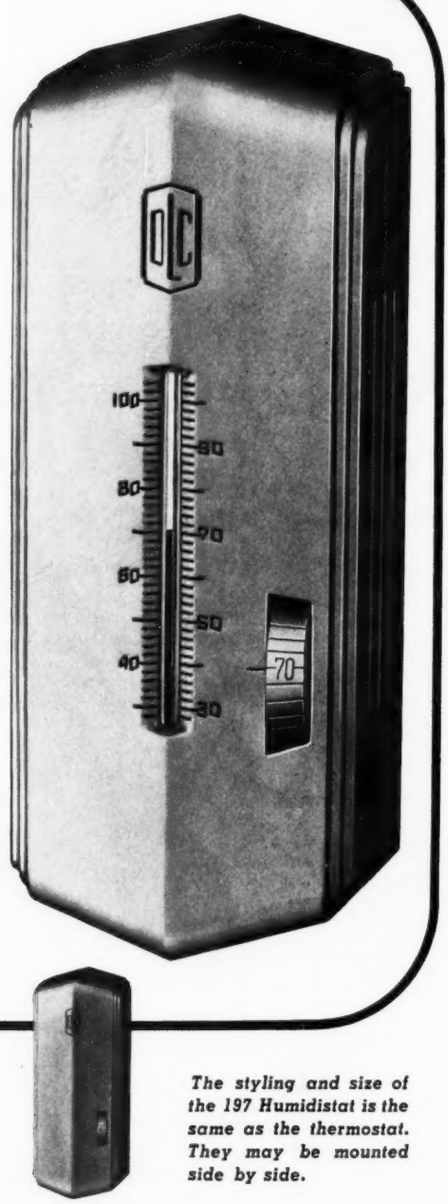
2. Easier to adjust for any length heating cycle and without the necessity of replacing the "pre-heater". "Pre-heater" is merely moved closer to or farther from the blade—a simple screw driver adjustment.

3. No assortment of "pre-heater" elements need be stocked by the dealer—one element handles all situations.

4. Greater accuracy, greater sensitivity and minimum droop (when outdoor temperature falls rapidly) have been accomplished by two important construction features. Mass effect, in and adjacent to blade and "pre-heater", has been avoided to minimize effect of residual heat. A very close balance is maintained between output of "pre-heater" and thermostat differential.

Thousands in use in past two years have proved these points.

Use the Two-Eleven to control all automatic heat installations regardless of type of fuel, burner, heating plant, building construction or exposure. It gives greater satisfaction and you avoid troublesome servicing.



The styling and size of the 197 Humidistat is the same as the thermostat. They may be mounted side by side.

DETROIT LUBRICATOR COMPANY

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Research Residence Suggestions for Reducing

Floor-Ceiling Temperature Differences‡

By A. P. Kratz* and S. Konzo**

University of Illinois

IN the first section of this report it was indicated that the condition of discomfort experienced in some of the first story rooms was partly attributable to the difference in the temperatures that existed between the breathing level and the floor, and partly to the fluctuations in the air temperature during a cyclical operation of the fan. It was also indicated in the preceding section that the variations in the air temperatures in the rooms could be reduced to some extent by the use of a two-speed fan. In addition, improvements of equal or even greater importance in the room comfort conditions may be effected by substantial reductions in the temperature differential between breathing level and floor, as illustrated in Table 4.

For ideal conditions of operation, such as is indicated in Table 4 with no difference in temperature existing between the breathing level and the floor, the effective temperature would be 66.1 deg. Under these conditions, the living zone dry-bulb temperature might decrease at least 4 F. during a cyclical operation of the fan before the effective temperature approached 63 deg. On the other hand, if the temperature differential between breathing level and floor were 6 F., the effective temperature in the living zone would be 64 deg., and a reduction in the dry-bulb temperature of only 1 F. in this zone would result in an effective temperature approaching the lower allowable limit of 63 deg. Furthermore, if the temperature differential between breathing level and floor became 8 F., the effective temperature would be 63.2 deg. and any reduction in the temperature in the living zone would result in an effective temperature lower than the allowable limit. In the case of a room in which a large temperature differential exists, improvement in comfort conditions may be made either by increasing the temperature at the level of the thermostat, particularly as the weather gets colder, thus increasing the temperature at all levels; or by maintaining the same temperature at the control level and reducing the temperature differential. Since the former method is more wasteful of heat, it is apparent that the only satisfactory solution of the problem consists in the maintenance of minimum temperature differentials in the given rooms. In connection with this study an extensive series of tests has been conducted over a period of years, the results of which will be briefly reviewed.

Table 4—Effective Temperature in Living Zone with Various Temperature Differentials

(Based on breathing level temperature of 72 F)

Air Temperature, F			Effective Temperature in Living Zone,a Degrees
Breathing Level	Floor Level	Average Living Zone	
72	72	72.0	66.1
72	71	71.5	65.7
72	70	71.0	65.4
72	69	70.5	65.0
72	68	70.0	64.7
72	67	69.5	64.3
72	66	69.0	64.0
72	65	68.5	63.6
72	64	68.0	63.2
72	63	67.5	62.8

aEffective temperature based on a relative humidity of 30 per cent. Values would be increased approximately 0.6 deg for a relative humidity of 40 per cent.

Effect of Storm Sash

In a previous publication[9] it was shown that by equipping the windows with tightly fitting storm-sash, the room temperatures at the floor level were increased, although no observable difference in the temperatures at the ceiling was recorded. The use of the additional barrier of glass against heat flow resulted in an increase in the temperature of the inner surface of the glass and in an increase in the temperature of the air which flowed down over the window sills and settled in the lower portion of the room. The data obtained in the dining room indicated that the increase in the temperature at the floor level was approximately 0.6 F. for an outdoor temperature of 50 F. and was approximately 1.8 F. for an outdoor temperature of 0 F.

In a similar manner, the use of sidewall insulation should tend to increase the temperature of the air flowing down the wall and hence tend to increase the temperature at the floor level. Adequate protection of the windows and walls will, therefore,

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**Special Research Assistant Professor, Engineering Experiment Station, University of Illinois.

‡A paper—"Study of Methods of Control and Types of Registers as Affecting Temperature Variations in the Research Residence," published in *Heating, Piping and Air Conditioning*, Dec., 1937, and presented at the 44th Annual Meeting of the American Society of Heating and Ventilating Engineers, New York, N. Y., January, 1938.

[9]Fuel Saving Resulting from the Use of Storm Windows and Doors, by A. P. Kratz and S. Konzo. (A.S.H.V.E. Transactions, Vol. 42, 1936, pp. 87-98.)

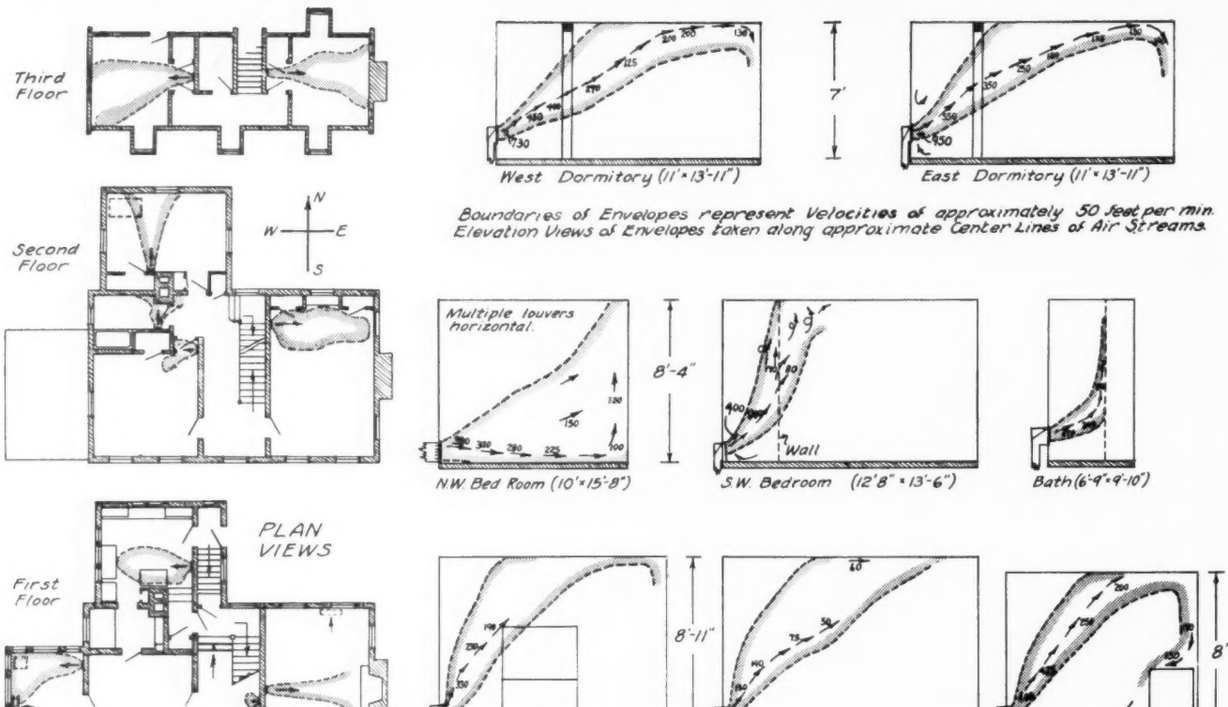


Fig. 12—Plan and typical elevation views showing air velocity distribution in rooms, baseboard perforated grille registers

not only reduce the loss of heat from the structure, but will also promote more comfortable room conditions by increasing temperatures in the living zone, and by minimizing the heat loss from the body to cold surfaces.

Effect of Air Temperatures

Incidental to the tests made with the oil-burning furnace and with the conversion unit, it was observed that although there was no difference in the temperatures at the floor obtained with the two installations, the temperatures at the ceiling in the case of the oil -burning furnace were slightly higher than they were with the conversion unit. The same quality of air (1,675 c.f.m.) was circulated in both cases, but the temperature of the air leaving the furnace (as measured in the north trunk duct) was approximately 4 deg. higher for the oil-burning furnace than it was for the conversion unit under comparable weather conditions. This slightly warmer air entered the rooms through registers of the perforated grille type and rising to the ceiling caused slightly warmer temperatures at this level. The excess was of the order of 0.2 F. and 0.8 F., respectively, for indoor-outdoor temperature differences of 30 F. and 70 F.

Effect of Air Volumes

The average temperature differentials for all of the rooms in the Residence have been recorded for each of the three main types of heating systems that have been installed. The temperature differentials, obtained for the gravity warm-air auxiliary-fan, and the forced-air system, are shown in Fig. 10. In all cases, the same type of register, consisting of a perforated grille, was used, and hence the warm air was introduced into the rooms in the same manner. In the case of the forced-air system, the differential for the sun room has been included in the average, whereas it was not included in the case of the other two systems, in which the sun room was not heated. Hence, the results as shown tend slightly to favor the gravity and auxiliary-fan installations, since the inclusion of a large value for the sun room in the average would give larger differentials than those actually recorded. Even so, however, it may be noted that the smallest temperature differential was

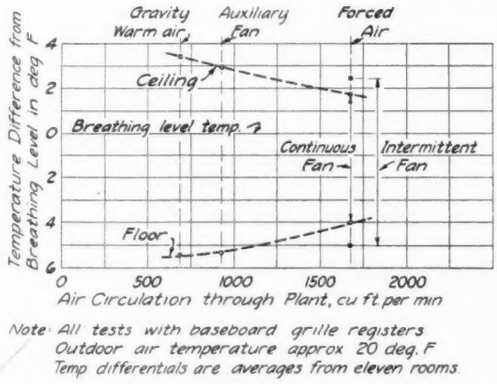


Fig. 10—Temperature differentials with gravity, auxiliary fan, and forced-air systems

obtained with the forced-air system, particularly with continuous operation of the fan. This reduction in temperature differential may be attributed not only to the increase in the quantity of air which was circulated, but also to the decrease in the temperature of the air which was introduced into the rooms.

Effect of Register Types in East Bedroom

There has been reported[10] an extensive series of tests made to determine the effect of various types of warm-air registers on the temperature gradient in the room. These tests which were made in the east bedroom under similar conditions of operation, indicated that for equal register air velocities, the minimum temperature differential was obtained when baseboard registers were used containing deflectors which projected the air slightly downward and thus spread the warm air near the floor.

Effect of Deflecting Types of Register in all of the Rooms

These studies were extended, during the latter part of the 1936-1937 heating season, to include all of the 12 baseboard registers in the Residence. The large perforated grille types of register, which had been in place since the construction of the house in 1924 were replaced with smaller, deflecting type registers, the sizes of which are given in Table 5. The new registers were of such construction that the air was projected either horizontally or downward into the room near the floor level and in some cases also deflected sidewise. In the bathroom and southwest bedroom on the second story, the louvers in the registers were adjusted so that the air was deflected away from walls a distance of 3 ft. in front of the registers. In the case of the bathroom and the two dormitory rooms, in which the register was located 3 in. above the baseboard, the air was projected downwards towards the floor.

As in all studies on temperature differentials the average temperatures in all of the rooms at the ceiling level, breathing level, and floor level were

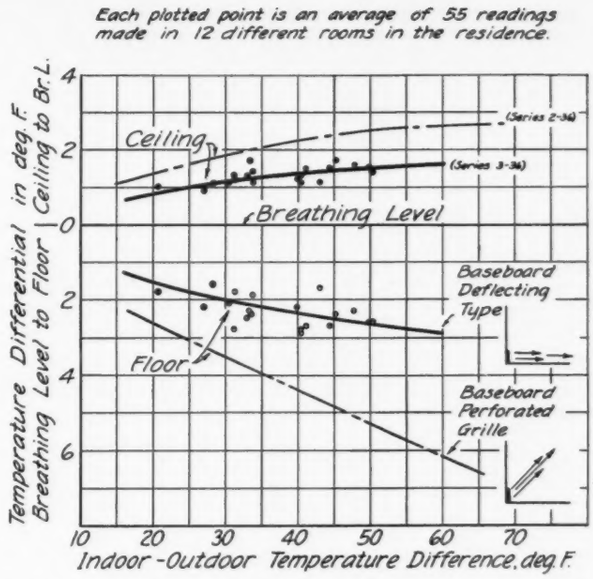

Each plotted point is an average of 55 readings made in 12 different rooms in the residence.
Temperature Differential in deg. F
Breathing Level to Floor | Ceiling to Br. L.
Ceiling
(Series 2-36)
(Series 3-36)
Breathing Level
Baseboard Deflecting Type
Floor
Baseboard Perforated Grille
Indoor-Outdoor Temperature Difference, deg. F

Fig. 11—Room temperature differentials with two types of registers (oil-burning furnace, intermitent single-speed fan)

obtained for each day, over a wide range of weather conditions. The results from the tests, which were under conditions of operation identical with those for single-speed intermittent operation of the fan in the oil-burning furnace unit, have been plotted in Fig. 11. For purposes of comparison the temperature differential curves shown in Fig. 8 have been transferred, and are shown as broken line curves in Fig. 11. It may be noted that a very appreciable improvement in the room temperature conditions was obtained with the new registers. For an indoor-outdoor temperature difference of 50 F for example, the total temperature differential from floor to ceiling has been reduced from 7.8 F. to 4.1 F.

Furthermore, the greatest improvement was observed in the differential existing from the floor to the breathing level. For an indoor-outdoor difference of 60 F., the temperature differential from floor to breathing level was reduced from approximately 6 F to 3 F. As may be observed from Table 4 this improvement in the living zone temperature was equivalent to an increase in the effective temperature of 1 deg. This improvement in the temperature differential, particularly in the living zone, represents the largest improvement effected by any single factor which has been studied, and substantiates the conclusions which were obtained from the earlier tests made in the east bedroom alone.

Table 5—Changes in Warm Air Registers in Research Residence[a]

Story	Room	Former Grille		New Deflecting Type Register				
						Type of Projection		
		Width, In.	Height, In.	Width, In.	Height, In.	Vertical Plane	Horizontal Plane	Free Area[b] Per Cent
First	Living	12	10	12	6	Straight out	Three way deflection in all registers on the first story	Approx. 90
	Hall	14	12	14	4	Straight out		
	Dining	12	10	12	6	Straight out		
	Sun. So.	12	10	12	10	Straight out		
	Sun. No.	12	10	12	10	Straight out		
	Kitchen	14	12	14	10	Straight out		
Second	E. Bed.	12	10	12	6	Straight out	Three way deflection	Approx.
	SW. Bed.	12	9	12	6	Straight out	Deflection to right	80
	Bath	10	8	10	8	Straight out	Deflection to right	
	NW. Bed	12	10	12	10	Straight out	Three way deflection	
Third	E. Dorm.	10	8	12	10	Deflection 22 deg. down	None	Approx.
	W. Dorm.	10	8	12	10	Deflection 22 deg. down	None	86

[a]All new registers on the basis of an average register velocity of approximately 500 fpm. All registers located in the baseboard. Change in registers made in April, 1937.
[b]Free area percentages based on opening size and not on gross size or trade designation size.

[10]University of Illinois, *Engineering Experiment Station Bulletin* No. 266, by A. P. Kratz and S. Konzo.

Air Flow Conditions in Rooms

The distribution and magnitude of the air flow into each of the 12 rooms, before and after the registers were changed, were studied by means of amemometers and smoke in order to determine the shape and location of the envelope of the air stream. In every case in which the perforated grille type of register was used, the air was projected into the room at an angle of from approximately 45 to 60 degrees and the warm air rose directly to the ceiling. In addition the air stream was confined to a small portion of the room, as shown by the envelopes in Fig. 12, and in this way local effects were accentuated. After the registers were changed the envelopes, as shown in Fig. 13, were spread out in a horizontal direction and confined to within about 10 in. above the floor, thus both diminishing any local effects and confining them to a region in which they would not be objectionable.

Summary

There remains little doubt that by the proper application of deflecting types of register, some of the problems arising from the variation in room temperatures may be avoided. Their application should be given especial consideration in houses that are not protected against heat loss, in rooms that have excessive exposure, in isolated rooms, and in rooms that are located on the first story.

General Summary and Conclusions

The following summary and conclusions may be considered as applying to the Research Residence and the conditions under which the tests were conducted.

(1) It was observed that although the air temperature at the breathing level was maintained at approximately 72 F. for all weather conditions, a certain amount of discomfort was experienced in some of the first story rooms, particularly when the outdoor air temperature was lower than approximately 15 F. This condition was especially noticeable during the off-periods of the fan in the forced-air heating system.

(2) The cyclical variation in temperature, during the on-periods and off-periods of the fan, in the living zone of the second and third story rooms was quite small, whereas that in first story rooms was about three times as large.

(3) More frequent cyclical operation of the fan tended to reduce the length of the off-periods of the fan and hence the temperature variation in the living zone. Furthermore, the number of off-periods occurring during the day was decreased when a method of control was used which provided for practically continuous fan operation.

(4) A comparison of the results of the tests made with a single-speed fan and those made with a two-speed fan indicated that the total daily costs for the two methods of operation may be considered as practically the same. However, from the standpoint of fewer number of off-periods per day and also from that of shorter duration for each off-period, it may be concluded that the heat supply to the rooms was more nearly continuous and that conditions were more favorable when the two-speed rather than the single-speed fan was used.

(5) The amount of dampering required on any given duct installation is dependent on the method of fan operation used. and is not the same for both continuous and intermittent operation of the fan.

(6) A reduction in the temperature differential between the breathing level and the floor may be effected by the use of storm sash, by the use of large volumes of circulating air at lower temperatures, and by the use of registers which deflect the air towards the floor. The results obtained from the use of deflecting types of register located in the baseboard were better than those obtained with the perforated grill type of register in the same location.

(*Continued on page* 94)

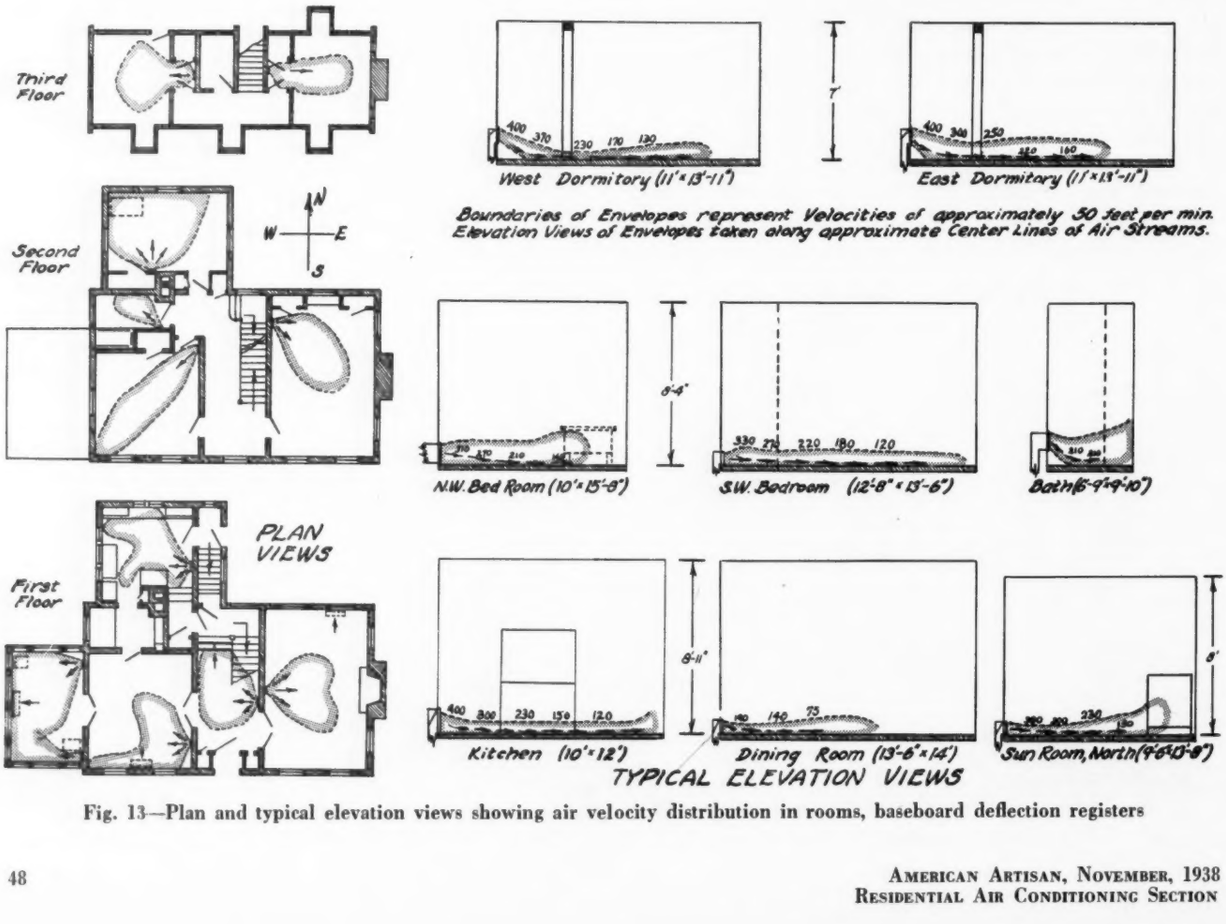
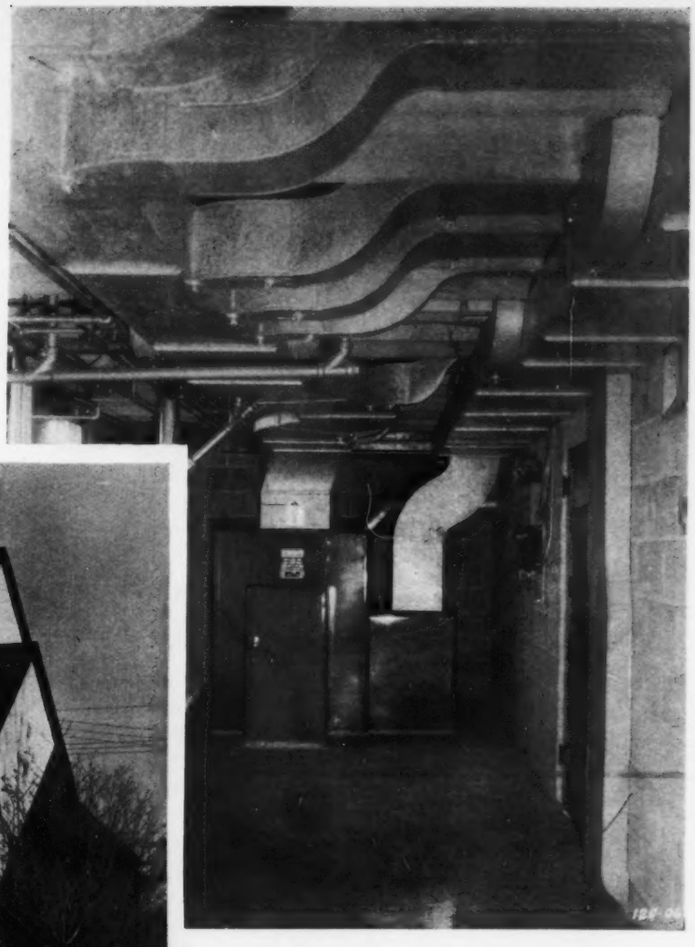
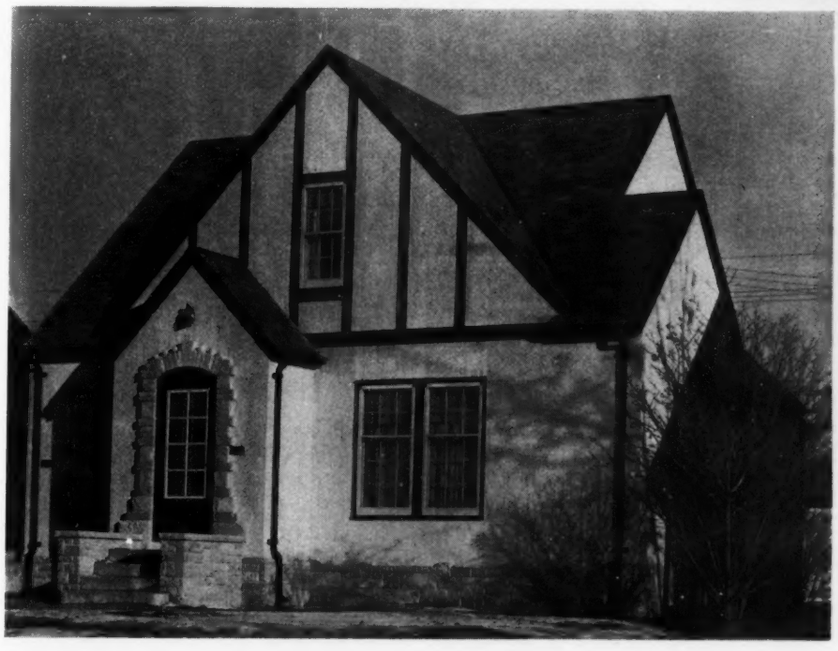


Fig. 13—Plan and typical elevation views showing air velocity distribution in rooms, baseboard deflection registers

Exterior of the house and view of equipment in basement. The Weir Oil Burning Furnace with Weir oil burner is located in one corner of the basement (see floor plan). One large supply main and one parallel return handle practically all the air. The ducts and fittings are sized for equal friction with frictional resistance held to a minimum. The Minneapolis Code heat loss sheet appears on the next page.





Designed According to the Minneapolis Code

THIS is a description of an installation made according to the specifications of the Minneapolis Heating Code. The heat loss, data sheets and pipe size calculations were made by the contractor—Cronstrom Furnace and Sheet Metal Works, Minneapolis.

Because the Minneapolis Code has been studied so widely by contractors and organizations interested in municipal heating codes, a brief discussion is presented to show how the accompanying data sheet was calculated. Also basement, first and second floor plans are presented to show the type of house and its general construction.

This is a new house—designed for two families. One family occupies the first floor, another family the second floor and one furnace heats both apartments. This installation is not zoned—one thermostat on the first floor starts and stops the oil burner and the contractor reports that during last winter temperatures on the second floor were practically identical with those on the first floor. The only service required was some balancing with branch pipe dampers after cold weather started.

Interesting, also, is the owner's report that only $80.00 was spent for fuel (both apartments) during practically all the heating season of the winter of 1937-1938.

One requirement of the Minneapolis Code is that all plans submitted must be accompanied by a complete heat loss sheet filled in on the city's standard form—the one shown. The heat loss sheet shown is for the first floor only; heat loss coefficients and temperature rise for the second floor are identical —the difference being in more cold walls and ceilings on the second floor.

There seems to be several commendable features to the Minneapolis data sheet. For instance, a space is left to indicate whether doors and windows are weatherstripped. Also, since the code is based upon ASHVE factors, an ASHVE Guide reference (year) is contained and right along side the Guide reference are several spaces in which the construc-

tion of the wall elements are shown by Guide reference number.

Under "Windows and Doors" the number, width of pane, height of pane, number of lights, lineal feet of crack and square feet of glass area are filled in in the proper spaces as shown. In explanation of the word "pane," looking at the exterior photograph we see that the two front windows in the living room have 30 "panes" of glass, but for code purposes each double-hung window has 2 "panes" even though these may be divided further. Also note on the exterior photograph that the upper "pane" is two-thirds the size of the lower "pane" which accounts for the two entries under "height of pane."

With respect to heat loss measurements, the Minneapolis code says—

"Such measurements shall be made from the building plans submitted to the Department of Buildings by the heating contractor. Should it subsequently develop that said plans submitted are inaccurate in any essential detail, it shall be the duty of the heating contractor, upon being notified to do so by the Inspector of Buildings, to make such changes in the heating installation as may be necessary to correct any resulting discrepancy therein — — — ."

The net result of this ruling has been much more careful initial inspection and design.

The Infiltration item is a sub-total of the already entered length of window crack (58.3 feet) times the coefficient for window looseness which, in this case is 38. This coefficient 38 is obtained from the table of Infiltration Through Windows (Table 2 of

HEAT LOSS CALCULATIONS — DEPARTMENT OF BUILDINGS — MINNEAPOLIS, MINN.

Weatherstrips Windows Yes—No	Weatherstrips Doors Yes—No	A.S.H.V.E. Guide Reference 1935	Construction No. Out. Wall	Int. Wall	Ceiling	Roof	Floor	Insulation Kind	Insulation How Applied
			48	—	9	—	—		Plaster Between Studs + Base

1ST Fl. LIVING Room | Length 19½ Width 13' Height 8'1"

Windows and Doors—Crackage and Area

No.	Width of pane	Height of pane	No. of lights	Lineal ft. of crack	Area sq. ft.	
2	24	× 24	2	—	21	101 CFM 2-12×5 Reg.
2	30	× 24/36	2	39	31.1	
DOR	3	× 6'8"	—	19.3	20	

		Coef.	Btu
Infiltration	58.3	38	2215
Glass	72.1	50	3605
Exp. wall (4+13+19½) 8½ =			
Net exp. wall 275.1 - 72.1 =	203	6	1218
Int. wall			
Ceil. or floor			
Total Btu.			7038

Required sq. ft. E.D.R. or sq. ins. W.A. Leader area

1ST Fl. DINING Room | Length 12¾ Width 9½ Height 8'1"

Windows and Doors—Crackage and Area

No.	Width of pane	Height of pane	No. of lights	Lineal ft. of crack	Area sq. ft.	
2	24	× 24	2	32	21	37 CFM 12×5 Reg.

		Coef.	Btu
Infiltration	32	38	1216
Glass	21	50	1050
Exp. wall 9½ × 8½			
Net exp. wall 76.8 - 21 =	55.8	6	335
Int. wall			
Ceil. or floor			
Total Btu.			2601

Required sq. ft. E.D.R. or sq. ins. W.A. Leader area

1ST Fl. KITCHEN & NOOK Room | Length 15½ Width 8½ Height 8½

Windows and Doors—Crackage and Area

No.	Width of pane	Height of pane	No. of lights	Lineal ft. of crack	Area sq. ft.	
1	30	× 20	2	16.2	10.9	65 CFM 12×5 Reg.
1	24	× 20	2	14.7	8.9	
DOR	2'8	× 6'8	—	—	17.8	
1	24	× 20	2	—	8.9	

		Coef.	Btu
Infiltration	30.9	38	1174
Glass	46.5	50	2325
Exp. wall (15½ × 8½) 8½			
Net exp. wall 194 - 28.7 =	165.3	6	992
Int. wall			
Ceil. or floor			
Total Btu.			4491

Required sq. ft. E.D.R. or sq. ins. W.A. Leader area

1ST Fl. MASTER BED ROOM Room | Length 15½ Width 11⅓ Height 8½

Windows and Doors—Crackage and Area

No.	Width of pane	Height of pane	No. of lights	Lineal ft. of crack	Area sq. ft.	
2	26	× 24	2	33	22.6	85 CFM 12×6 Reg.

		Coef.	Btu
Infiltration	33	38	1254
Glass	22.6	50	1130
Exp. wall 15½ × 8½ =			
Net exp. wall 125.3 - 22.6 =	102.7	6	616
Int. wall 11⅓ × 8½ =	91.6	13.2	2931
Ceil. or floor			
Total Btu.			5931

Required sq. ft. E.D.R. or sq. ins. W.A. Leader area

1ST Fl. BATH Room | Length 6½ Width Height

Windows and Doors—Crackage and Area

No.	Width of pane	Height of pane	No. of lights	Lineal ft. of crack	Area sq. ft.	
1	24	× 20	2	14.7	8.7	18 CFM 10×4 Reg.

		Coef.	Btu
Infiltration	147	38	559
Glass	8.7	50	435
Exp. wall 6½ × 8½			
Net exp. wall 52.6 - 8.7 =	43.9	6	263
Int. wall			
Ceil. or floor			
Total Btu.			1257

Required sq. ft. E.D.R. or sq. ins. W.A. Leader area

1ST Fl. REAR BED ROOM Room | Length Width Height

Windows and Doors—Crackage and Area

No.	Width of pane	Height of pane	No. of lights	Lineal ft. of crack	Area sq. ft.	
2	24	× 24	2	16	21	38 CFM 12×5 Reg.

		Coef.	Btu
Infiltration	16	38	608
Glass	21	50	1050
Exp. wall (12 + 11⅓) 8½			
Net exp. wall 188.4 - 21 =	167.4	6	1005
Int. wall			
Ceil. or floor			2663
Total Btu.			

Required sq. ft. E.D.R. or sq. ins. W.A. Leader area

Exterior of the shop of Cronstrom Furnace & Sheet Metal Works, engineers and installers of this heating system.

the Guide). These windows are double hung, wood sash, weatherstripped and, according to Table 2, infiltration is 23.6 cubic feet per hour per foot of crack. Then 23.6 times .075 (weight of one cubic foot of air) times .24 (specific heat of air) times 90 (temperature difference used in Minneapolis) equals 38.23 called 38 in the heat loss sheet.

The item for glass loss for the living room is shown as 72.1 square feet of area times the coefficient 50 equals 3,605 Btu loss. The coefficient 50 is obtained, according to contractor Cronstrom, by multiplying .55 times the temperature difference of 90 degrees. While, states Mr. Cronstrom, the coefficient in the Guide is shown as .45 for double windows, tests at the University of Minnesota show this coefficient to be .55 and this figure is used in Minneapolis.

The item for net exposed wall is shown as 203 square feet of net wall times the coefficient 6 equals 1,218 Btu. The coefficient 6 is for wall construction number 48 in the Guide which is stucco on sheathing, studs, stud space filled with insulation, ½-inch rigid insulation for a plaster base and plaster inside. The Guide coefficient is .06. Then .06 times 90 equals 5.4 plus 10 per cent for loss through studs equals 6.

The total heat loss of the living room is, as shown in the heat loss sheet, 7,038 Btu per hour.

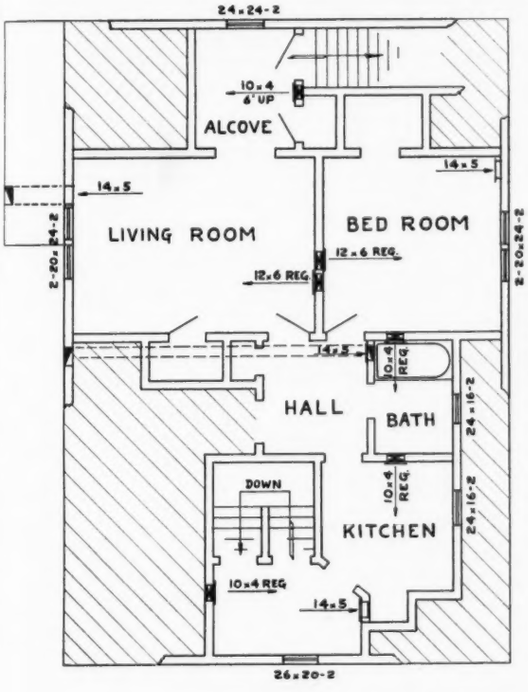
To arrive at the pipe sizes required, the Minneapolis Code States that either trunk line or individual pipes may be used and the amount of air required for each room shall be figured from an assumed register air temperature of 135 degrees and in residences the contractor may have a choice of a low velocity, medium velocity or high velocity system with air velocities through basement mains of 500, 750 and 1,000 fpm respectively; velocities of 450, 600, 750 respectively in branch pipes; 350, 500, 600 fpm in wall stacks; 300, 350, 400 fpm through baseboard registers; 500, 550, 600 fpm respectively through wall registers above the breathing line.

Also, the contractor may design his duct system by the velocity method or friction pressure loss method.

This installation is designed on a register air temperature of 135 degrees, with designed velocities of 750 fpm through mains, 600 fpm through branches,

500 fpm through wall stacks, which makes the installation a medium velocity system. Ducts are designed on the pressure loss basis employing elbow radii not less than equivalent round pipe diameters and are grouped into one trunk which supplies all registers excepting one. All registers are located on inside walls just above the baseboard, excepting the baths and kitchens where the registers are six feet above the floor. All returns are placed in outside walls and air is brought back through joist spaces connecting into the single large return shown in the photograph. Each branch has a balancing damper as prescribed in the code.

The total heat loss of the house is under 100,000 Btu. The unit (Weir, oil-fired, air conditioning furnace with a Weir oil burner) has a total Btu



The second floor plan is lettered upside down. The alcove is at the front of the house (bottom).

capacity at the bonnet of 150,000 Btu, more than ample for weather colder than design conditions.

Perhaps some brief comment covering calculation of cfm's may be interesting to code students. The Minneapolis code states—

"Calculate the weight of air to be circulated to each room, using the following formula:

$$W = \frac{H_1}{0.24 \times Td}$$

Where W = weight of air to be circulated in pounds per hour.

H_1 = Total calculated heat loss in Btu per hour, plus ten (10) per cent safety factor.

0.24 = Specific heat of air.

Td = Temperature drop.

(d) Obtain volume of air, in cubic feet per minute (q), for warm air and cold air, as follows:

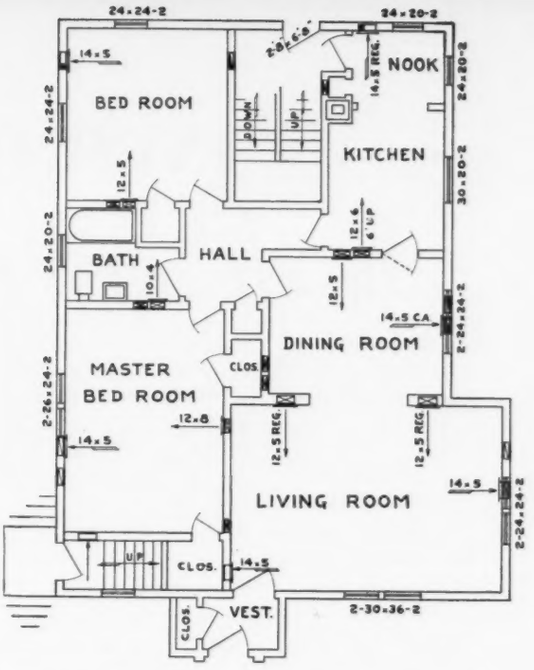
$$q = \frac{W}{60d}$$

where q = volume of air in cubic feet per minute.

d = density of air in pounds per cubic foot at assumed average warm or cold air temperature and standard barometric pressure (29.92 inches of mercury).

60 = conversion factor from hours to minutes.

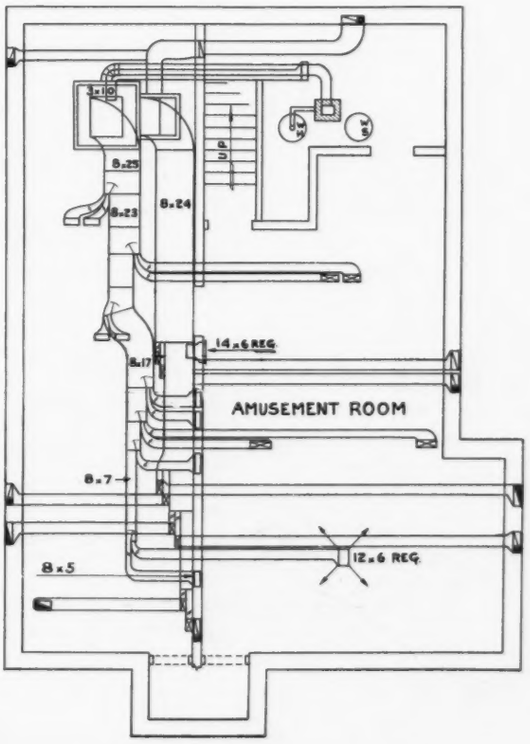
Values of d may be obtained from any standard tables on properties of air.



Applying these formulas in the living room, we get 7,038 Btu divided by .24 times 70 degrees equals 418 + pounds of air per hour which, divided by 60 (minutes in an hour) times .07 (density of partially saturated air per cubic foot) equals 101 + cfm.

Registers in this installation are grouped by sizes for simplification of installation and fittings with the result that some register air velocities are low (under 100 fpm).

The installation, according to Mr. Cronstrom, has been one of the most satisfying the firm has ever installed. Full right-of-way was given the heating contractor in the choice of joist and stud spaces, openings required; the insulation, weatherstripping and storm sash reduce troublesome infiltration and condensation; the fuel bill was exceptionally moderate; the apparatus performed without service call-backs; and the designed conditions were generously satisfied. All duct work was fabricated from flat galvanized sheets without use of any factory made fittings.



INFILTRATION LOSS

Its Effect On Furnace-Blower Capacity

By G. C. Ziliotto
Mechanical Engineer, Milwaukee

THERE seems to be no agreement in regard to the effect that infiltration losses have in determining the proper size for a furnace-blower heating unit. Some authorities maintain that the sum of the infiltration losses for the different rooms into which a building is divided should be added to the other heat losses in order to arrive at the capacity of the furnace and the blower. Other authorities maintain that it is not necessary to use the total infiltration loss as given by the sum of the separate infiltration losses for all the rooms, but that it is sufficient to use half of this total in figuring the capacity of the furnace and blower. It is all right, the latter contend, to compute the infiltration losses for every room as the wind blows from different directions at different times, but since it cannot blow from all directions at the same time, we should not use the total infiltration loss in determining the size of our heating plant.

The reasoning seems logical on the surface, but on further consideration it proves totally erroneous. An example may serve to prove this point.

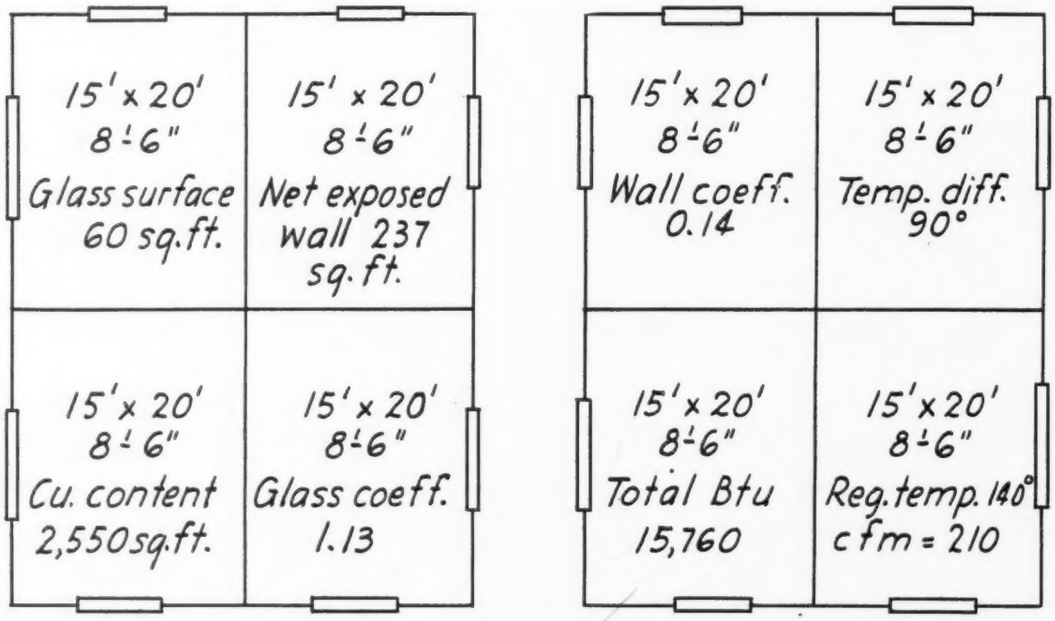
Suppose that we want to heat a house of rectangular plan, having four identical rooms on each of two floors. All rooms will be corner rooms and we will suppose that each has windows in both exposed walls. The rooms are 15x20 feet and the ceilings are 8 feet 6 inches high. The glass surface in each room is 60 sq. ft.; the net exposed wall is 237 sq. ft.; the cubic content is 2550 cu. ft.

There are no storm windows, so that the heat transfer coefficient for glass can be assumed to be 1.13 Btu. per sq. ft. per degree difference. The coefficient for the wall is assumed to be 0.14 and the infiltration losses are computed on a basis of one and one half changes per hour. The temperature differential is assumed to be 90 degrees with an average inside temperature of 70 degrees.

On these data, the heat losses for each room will be as follows:

Glass	6,100 Btu. per hour
Net exp. wall.....	2,980
Infiltration	6,680
Total	15,760 Btu. per hour per room

Our heating system will have to be designed to supply 15,760 Btu. per hour to the rooms exposed to the



On these floor plans the heating data have been entered. Should infiltration loss be calculated for all eight rooms or for only four rooms? The text discusses this question.

wind. Because any one of the eight rooms may at one time or another be exposed to the wind, the system will have to be designed so that it can supply to *any* room 15,760 Btu. per hour. If the temperature of the air is 140 degrees at the supply register and 65 degrees at the return, the register, or registers, in any one room will have to deliver 210 cu. ft. of air per minute.

Short of zoning every room, the duct system, once balanced, will deliver this amount of air to each room whether it is exposed to the wind or not, provided the blower has a capacity of 210x8, or 1,680 cfm.

The temperature of the air at the supply register of a room exposed to the wind will have to be 140 degrees in order that the 210 cfm. of air deliver 15,760 Btu. per hour and, since the air comes from the same bonnet, its temperature at all the other registers will be, except for small variations due to the different lengths of the ducts, substantially the same. The furnace must therefore have a capacity of 15,760x8 or 126,080 Btu. per hour at the registers.

A room which is not at a given time exposed to the wind will require, in order to maintain a temperature of 70 degrees, only 9,080 Btu. per hour, whereas it will receive 15,760 Btu. As a result, the temperature of this particular room will rise until the increased temperature differential between the inside and the outside re-establishes the equilibrium between the heat losses from the room and the heat input into the room.

The higher room temperature will be reflected in a somewhat higher temperature of the air at the return register which represents a saving in heat, and to that extent the load on the furnace will be reduced. Since there will be four rooms not exposed to the wind, the total saving or reduction in the furnace load will be four times that resulting from one room.

It is, however, to be understood that this saving cannot be equal to the difference between the heat required to maintain a 70-degree average room temperature when the room is exposed to the wind and the heat required to maintain the same temperature when the room is not exposed to the wind, or: 15,760 — 9,080 = 6,680 Btu. per hour. The temperature of the air at the return register can be higher only if the average room temperature is higher, and if the average room air temperature is higher than 70 degrees, the heat losses through the walls and the glass surface will become greater than 9,080 Btu. per hour. This extra loss cannot be either avoided or recouped.

Therefore, if we want to heat any one room which happens to be exposed to the wind to the contractual temperature of 70 degrees, we shall have a higher temperature in those rooms which are not at the time exposed to the wind, and as a result we shall not be able to save the amount of heat corresponding to the lack of infiltration loss for these rooms.

Let us now see what would happen if we were to follow the recommendation of deducting one half of the total infiltration losses in determining the capacity of the furnace-blower unit.

Evidently the capacity of the furnace would be 126,080—26,720 or 99,360 Btu. per hour at the registers, and the capacity of the blower would be 1,330 cfm.

If we do not intend to rush to adjust the valves at the registers or the dampers on the warm air branches every time the wind shifts, the duct system will deliver the same amount of air and the same amount of heat to every room irrespective of whether it is exposed to the wind or not. This amount of heat per room will be 99,360 ÷ 8 or 12,420 Btu. per hour. The rooms exposed to the wind have each a heat loss of 15,760 Btu. per hour for a 90-degree differential between the inside and the outside. Our 12,420 Btu. per hour will not be able to maintain such differential, therefore, if the outside temperature is 20 degrees below zero, the room temperature cannot be 70 degrees, but will be lower.

In our example the temperature of the rooms not exposed to the wind will still be higher than the specified 70 degrees, but the important fact is that we shall not be able to heat the wind exposed rooms to the required temperature of 70 degrees. It seems, therefore, preferable to err slightly in the direction of higher-than required furnace-blower capacity by including in the heat losses the whole of the infiltration loss in determining the size of the heating unit, than to err in the opposite direction.

A. S. T. M. Revised Fuel Oil Specifications

REVISED tentative specifications for fuel oils, providing for five grades of oil instead of six, were issued recently by the American Society for Testing Materials. The old number 4 grade has been eliminated.

Among the changes in methods of testing is the use of a new test for sediment in fuel oil by extraction, based on a method used by the Federal Specifications Board.

Also included in the new standard is an adaptation of the distillation procedure for obtaining 10 per cent residuum for determination of carbon residue in Grades 1 and 2. (Grade 1 covers a distillation oil for use in burners requiring a volatile fuel and Grade 2 covers a distillate oil for use in burners requiring a moderately volatile fuel.)

A number of modifications have been made in the detailed requirements for oil. The maximum flash point for No. 1 has been raised to 165 deg. F instead of 150 deg., and for No. 3 grade the maximum is 230 deg. F instead of 200 deg. F. The minimum flash point for No. 5 grade, a medium viscosity fuel, is now 130 or legal in place of the former 150. Grade No. 3, a low viscosity fuel, has a new maximum pour point of 20 instead of 15.

The maximum carbon residue requirements for Grade No. 1 is 0.05 per cent on 10 per cent residuum but this can be increased to a maximum of 0.12 per cent when the oil is to be used in other than sleeve-type blue-flame burners. The limit may be specified by mutual agreement between the purchaser and the

(*Continued on page* 61)

Comparative Fuel Costs *for a*

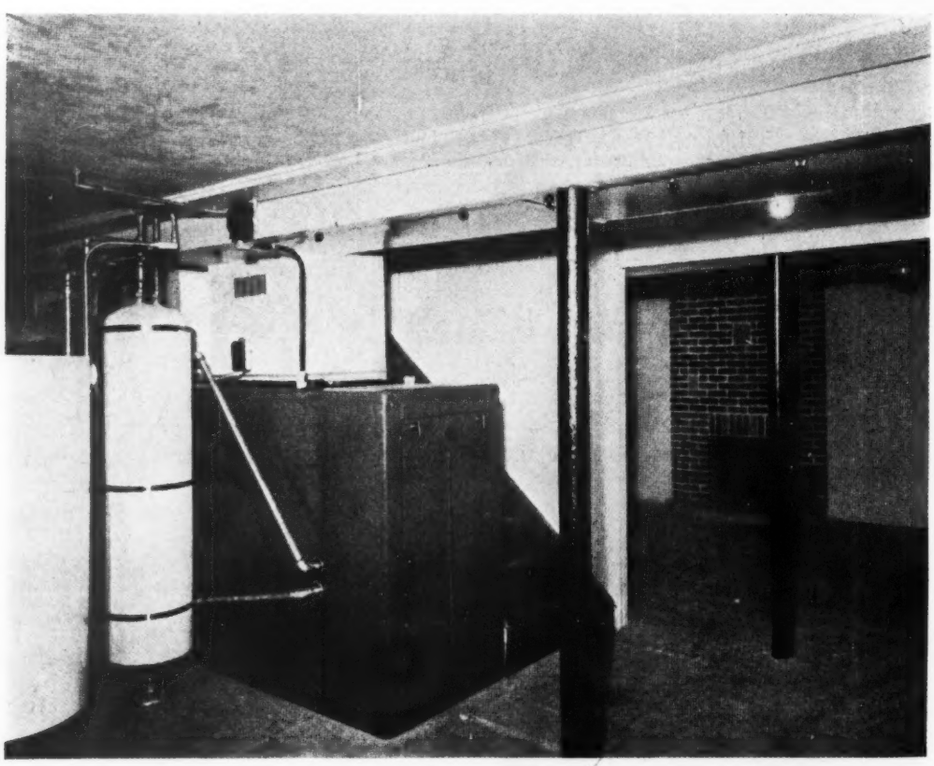
IN an article titled "An Engineering Approach to True Human Comfort," which appeared in the January, 1937, AMERICAN ARTISAN, we attempted to set forth the known factors affecting human comfort, to analyze these facts according to their relative importance, to evaluate existing heating methods and to evolve a practical method of supplying approximately correct amounts of both radiant heat and gently moving, warm, moistened and filtered air, for that most difficult of all heating problems, the single, detached residence.

It was shown that existing methods often fail to correct cold drafts at ankle level and, in many cases, accentuated this annoying condition; that "spot" methods of heat introduction frequently fail to provide that little understood—but most vital factor—radiant heat, or, as in the case of a stove or high temperature water or steam radiator, cause local over-heating on one side but fail to compensate for the loss of heat from the other side of the body caused by radiation to cold walls and windows.

How can discomfort caused by radiant heat loss be overcome? Insulation and storm sash help, but still permit about 50 per cent of our bodily heat loss to be dissipated to cold walls, these surfaces being far below the inner body temperature of 98.6 degrees F., and well below the estimated surface temperature of 75 degrees F. for the human body when perfect comfort is enjoyed.

If the physicists have made no error in determining 75 degrees F. as the body surface temperature at the comfort point, radiation ceases when all the surfaces around the body are held at 75 degrees F., but this would require a complete change in methods of building construction and this was not sought as a solution; rather, a method which could be accommodated in existing structures and the common systems of construction.

The floor, being at all times the surface closest to the human body, can cause great discomfort when it is much below 75 degrees; equally, it may be used to provide warmth radiantly at the temperature difference of (98.6—75) before exceeding our inner body temperature. In this range of temperature, the body receives no sensation of heat (an ideal condition) for heating (so-called) is merely a method of preventing too rapid cooling from our inner 98.6 degrees to skin surface 75 degrees. In transferring heat, the distance our body is from the hot surface must be considered exactly as we consider light—as the square of the distance. But a "black" (non-reflective) body will receive heat at the 4th power of the temperature dif-



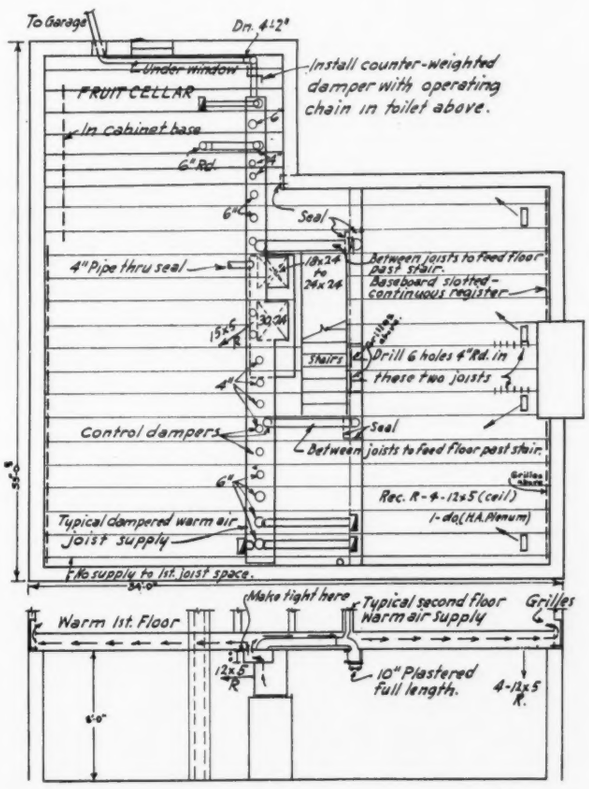
Basement view of warm floor plenum system for which fuel costs are published. The duct along the center beam opens into all joist spaces, permitting air to flow under floor to warm air registers in outside walls in room above. Quadrants control joist space air volume.

Warm Floor Plenum System

By Everett S. Buck
Fort Wayne Air Conditioning Co.,
Ft. Wayne, Ind.

ference of the "hot" and "cold" bodies. Thus, slight increases above body surface 75 degrees have a tremendous effect, especially from the floor.

Air temperatures far below those which we are accustomed to associate with comfort, can be adapted in combination with large, warm surfaces. In an actual test house with an average floor temperature of 95 degrees, it was found the room air had to be reduced to 63 degrees to prevent "too hot" conditions.



Plan of warm floor plenum system showing duct and joist spaces and warm air slots in baseboard of first floor rooms. Also elevation of system.

This not only greatly simplifies the problem of maintaining high relative humidities without dew-point condensation, but the potential fuel economy is obvious, for fuel use is directly proportional to the indoor and outdoor temperatures. With our winter mean of 40 degrees, comfort at 65 degrees should set a fuel ratio of 25/35 when compared with the 75 degree comfort required with "spot" heating systems. This report provides data on this assumption.

However, to hold the floor at a constant 95 degrees requires an ideal temperature control system and better burners than are now obtainable. No attempt was made to build such a system, despite the need for both, but rather to see what could be accomplished with the equipment that is available to all, by better distribution of both heat and air.

Fuel Costs for "Twin" Houses

By fortunate chance we had two almost identical houses, for which identical burners, conditioners and controls had been selected. Drawings of these two houses were used to illustrate the January article and are here reproduced again. The houses are identical in external perimeter and ceiling height. Each has 4 bedrooms, 2 baths on the second floor, full 8-foot basements which are not partitioned, but used as combination play and utility rooms. The zero-70-degree heat loss of these big basement rooms is about 35,000 Btu. and they were kept at comfort temperature most of the time. A small offset in the first floor of House A made its heat loss above the basement, calculated at zero-70-degrees and one hourly air change, total 107,000 Btu. compared with 99,000 Btu. for House B, which is the warm floor job.

House A is heated by the air distribution system used for the past 15 years known to many as the Hot-Kold system. In essence, the system consists of a high-velocity, high-temperature, low-volume, wide and shallow air stream, delivered adjacent and parallel to one cold wall with enough velocity to reach the other cold wall; two grills or nozzles being used for rooms with three cold walls. The ejector effect causes all the upper room air to be constantly forced to the zone where the air is being rapidly cooled, but the resultant mixture of cool and hot air along the outer wall must be warm if the proper velocity is used. The air comes back through the occupied (living) zone at low velocity and comfortable temperature because the air is removed from the lower levels mechanically, either through a register on the same wall as the supply, or through a door which lets the air pass to the big, main return at the foot of the stairs.

These jobs must be carefully designed. If the installation uses a large volume-low air temperature conditioner in a cold-wall, leaky window house, a small quantity of air (a little more than the calculated infiltration) should be withdrawn from beneath each window, a device which is not necessary if the conditioner will give warm enough air at high enough velocity.

For proper conditioning, the air must be well mixed and moving constantly through the living zone. This cannot be done by letting the air dribble up to the ceiling, across to the outer wall, removing it there. A room may be heated this way but the air will be stag-

TABLE A

RECORD OF FUEL OIL DELIVERIES

1936-7	House "A" with standard "Hot-Kold" distribution system.	House "B" with Warm Floor System for first floor, Hot-Kold hi-velocity for 2nd floor.	
Sept.	250 gal.	250 gal.	
Nov.	180	200	
Dec.	360	200	
Jan.	330	200	
Feb.	185	200	
Mar.	200	200	
Apr.	175	200	
	1680	1450	
1937-8			
Oct. 1	200	100	Oct. 14
Nov. 6	130	200	Nov. 8
Dec. 4	230	200	Dec. 7
Dec. 22	130	200	Dec. 31
Jan. 8	200	200	Jan. 22
Jan. 29	200	200	Feb. 12
Feb. 25	200	200	Mar. 22
Mar. 19	180		
	1470	1300	
Two year total =	3150 gal.	2750	

nant and temperature spotty. It must be remembered that heating or cooling, solely by means of air, must be done with entering air that is too hot or too cold for comfort, and the better the job of mixing before the air reaches the human body, the better the results will be. Baths and other rooms too small to circulate by this method are fed low and at low velocity (below 200 fpm) to avoid too large an area of discomfort.

We were unable to obtain constant operating fans, so we did the next best thing, setting the controls to provide especially frequent cycling of both burners and fans. Thus, the burner could only run long enough for the conditioner to get well warmed, while the fan would continue to run for a considerable period, wiping this heat out of the heavy metal surfaces. High specific heat, heavy combustion chambers, with closure of all air inlets to these during burner "off" periods were economy items that compare favorably with the much-needed, two-rate or the modulating burner. Without such precautions, the average 100,000 Btu. house in this climate uses around 2,000 gallons of oil —if the occupant really heats the house all over and does not spend part of the winter in Florida, but let us look at the actual fuel used and the temperatures maintained in these two houses: (Table A.)

Both the above winters were within 1 per cent of our 25-year normal 6202 degree days. During this time, House A carried an average temperature that corresponds quite closely to our own comfort temperature needs; i. e., around 72 degrees in ordinary weather, but in very severe weather, the stat was moved over to provide 75 degrees, to compensate for cold wall and window effect. This change of setting was not needed in House B, in fact, quite the reverse, for as the weather grew colder, the unit operated at more frequent intervals, which kept the floor at a higher temperature. By placing the stat low and squarely in the path of the air returning to the single, central return, the unit was caused to cycle ahead of any recordable change at any average point in the living zone, with the result that radiant-shielded thermometers hung on a standard which could be moved all about the first floor, read 72, 72 and 73 at ankle (4 in.), mid-point (4 ft. 6 in.) and 6 in. below the ceiling, respectively. This was entirely too warm for our own feeling of perfect comfort, especially during severe weather, when the influence of the warmer floor became very apparent, much more than enough to compensate for cold wall and window effect.

Fire Hazard

We have received numerous inquiries as to the fire hazard of these multiple orifice distribution ducts.

In the design of these systems provision is made for effective gravity circulation in case of fan failure, which is advisable in any direct fired system. The area of the returns is greater than that of the dampered orifices leading to each joist space. Since each joist space is typically handling only 25 cfm with the fan running and the total heat is but 10% to 20% of the room total, it naturally follows that this system sets up less fire hazard than the conventional single register delivery.

In the event of current failure and simultaneous failure to close the fuel valve, which is a remote yet "claimed" occurrence, the single register per room duct system might establish gravity circulation with air hot enough to ignite wood adjacent to the duct, or furnishings within the room, adjacent to the register, but in the "Warm Floor System," with only a small portion of the room total heat delivered at any one point, radiation will reduce the temperature to a point well below that which will ignite wood. It is advisable to insulate the top of the main supply duct where it crosses under the joists, a precaution which should be observed with any direct fired system.

Tests of these "Warm Floor Systems" with the fan shut off and with the fuel valve held wide open show the system tends to establish gravity circulation with an air temperature not exceeding 400°. Since only a small quantity of air can flow into any joist space, the radiation loss quickly drops the air temperature to a safe point because this small total heat is given such a large area in which to lose heat by circulation and radiation.

These may seem to be unnecessary precautions in the case of gas or oil burning systems with Underwriter's approved controls, but should certainly be observed in connection with stoker or hand fired coal systems.

Characteristics of Air Borne Particles [Part 4]

By John W. Kurtz

Head, Department of Engineering
Municipal University of Omaha

This article, the articles in April, July and September are taken from a thesis of the author—"The Relative Efficiency of Air Conditioning Filters"—prepared as a thesis for a Master's Degree in Mechanical Engineering, University of Iowa. This article describes the testing equipment and method.

THE experimenter started the work reported in the issues with a desire to contribute something to the field of air conditioning or rather one phase of air conditioning, the cleaning of air by means of filters. A desire to determine to what extent the filters on the market actually do remove pollens, spores, dusts, and mold or bacteria from the air stream. [*American Artisan, April, July, September,* 1938.]

The first problem was to find a means of testing these filters, which varied in thickness and size, material and specifications.

Development of the final apparatus followed from investigations in the following order:

Berkefeld Filters were found to be too slow and necessitated complete drying and weighing to determine the quantity by weight of dust.

The possibility of running the contaminated air stream through a glass trap (containing syrup) and centrifuging the diluted wet dust particles proved

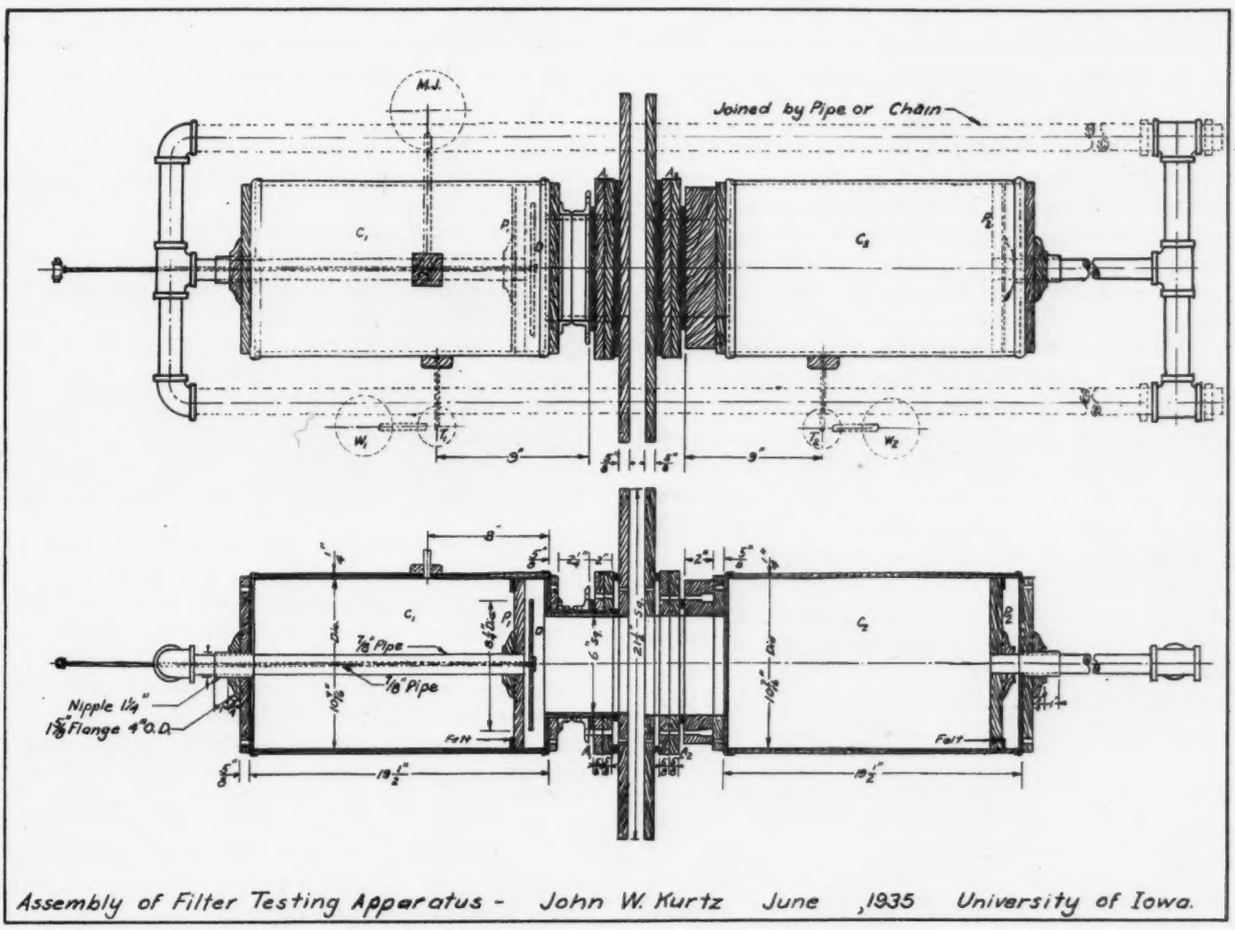


Fig. 7—Assembly drawing of testing apparatus. Above, position of pistons after a charge of contaminated air has been passed through the machine.

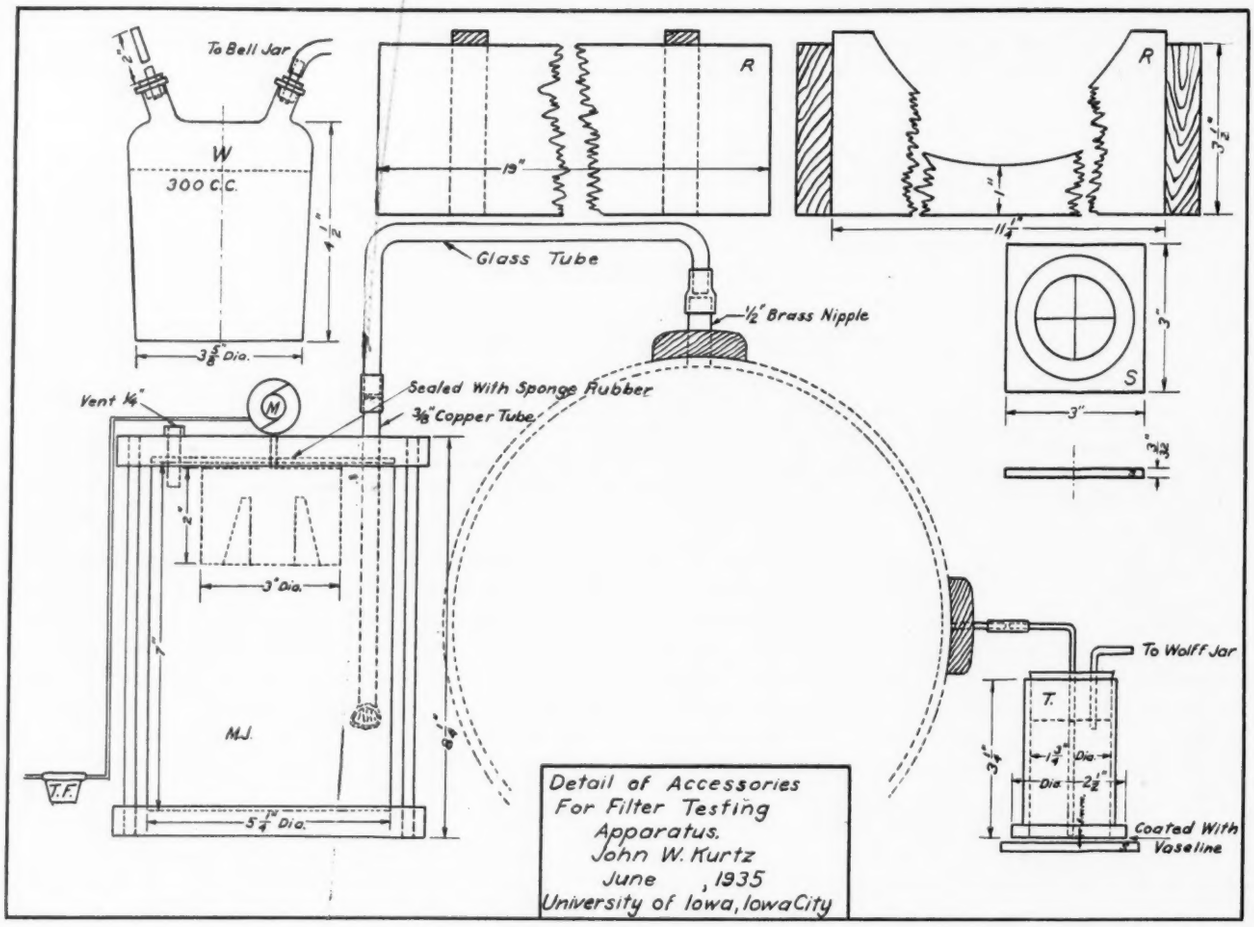


Fig. 8—Details of supplementary equipment, Rack "R" suppports the drum. "W" is one Wolff jar; "MJ" is the mixing jar.

to be unsatisfactory since some dusts and some pollens cannot be wetted hence cannot be separated by centrifuging. Lycopodium will bounce from a syrup or glycerine coated slide. It acts as though it was covered with an oil film when placed in water.

Air cells ten millimeters wide, twenty millimeters long and one millimeter deep were constructed. Equal samples of contaminated air, before and after filtering, were passed through each cell and counted under the microscope. The count of the filtered side was so low that the results were discarded. The efficiencies fluctuated more than ten per cent. Aspirators were used to draw the samples through the air cells.

A Howard Mould Counting Chamber was purchased but could not be used as the sample of air was too small. This experience led to another similar test which drew the air, by means of aspirators attached to two hole flasks, on the bottom of which were placed vaselined slides (the dust was impinged on the slides) but no efficiency could be computed since the exact volume of air tested could not be ascertained.

A definite volume of air seemed to be the only solution of the problem. A dust free room or compartment was out of the question. Three types of chemical air filtering apparatus were investigated but none would deliver a sufficient supply of pure air.

The atmospheric dust varied so much from day to day and hour to hour that any results obtained by using it as an air stream would be unreliable. Definite contamination with a known contaminant was found to be necessary. Plating of cultures was anticipated, with the thought in mind that bacteria would be a suitable contaminant and photomicrographs made of the filtered and unfiltered air, from which the bacteria counts could be taken. This method proved to be too slow and expensive. Nevertheless, this method may have proven to be of considerable value to the medical profession.

After weighing all of the available information, the problem of controlling a given volume of air was still paramount. This problem was solved by using two Master fabric drums as a gasometer.

Proper contamination of the air in the first drum was impossible by gravity, and also with an aspirator. Finally, the idea of a mixing jar provided with a small fan at the top was developed. A small bellows augmented the fan when necessary.

The method of testing the various filters was reduced to the simple procedure of; using for each run a definite contaminant, thoroughly mixing in a mixing jar and admitting this mixture to a given volume (.85 cubic foot) of air, taking a definite

sample (300 cubic centimeters) of the contaminated air and depositing the particles in it on a vaseline slide, the contaminated air is forced through the filter. A sample of 300 cubic centimeters is taken from the second cylinder, the two slides are counted under the microscope and the efficiency computed from these counts. Complete details of the procedure are given under the description of the apparatus.

Construction of Apparatus

The assembly drawing, (Figure 7) of the apparatus shows sufficient detail and relationship of parts to be readily understood. The front view shows the apparatus in section after the charge of contaminated air has been forced through the filter into cylinder C_2.

The large adapters of five ply fir are shown in place for testing the large filters. "C" clamps are used to hold the filters between these adapters. When small filters are tested the large adapters are removed and the small adapters hold the filters in place with four ¼" x 8" bolts. All joints and bearing surfaces are made air tight with band sponge rubber.

The movement of the pistons is controlled with pipe when small filters are tested and chain when the large adapters are used. The moving picture film shows how varied weights of sand in a bucket, pull the pistons at a definite rate of speed to produce the required face velocity for the filters tested.

The pistons are each backed with felt to make a sliding fit in the Master drums. This felt was

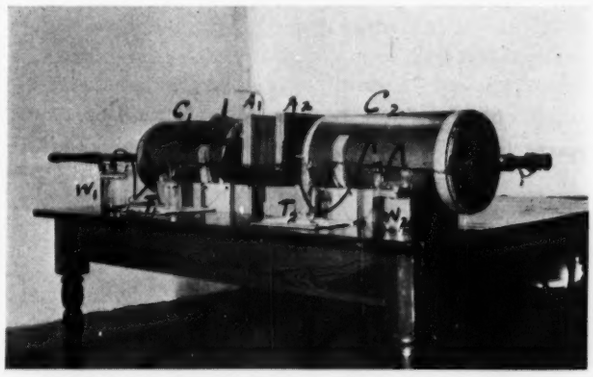


Fig. 9—Identified apparatus, C_1, cylinder 1, (.85 cu.ft.); A, adapter for cylinder 1; W_1, Wolff jar; T, flanged testing jar; F, filter; A_2 adapter for cylinder 2; C_2 cylinder 2; W_2, Wolff jar; T_2, flanged testing jar.

adjusted frequently to take up the wear. The dusts did not come in contact with the felt, nevertheless, they were brushed, vacuum cleaned and blown off with bellows, as were the cylinders after each test.

The assembly drawing shows the interstices at each end of the cylinders next to the filter. These spaces and the reduced area of the filter tested compared with the cross section of the drums made it impossible to test the absolute efficiency of the filters. Since this condition existed for all tests it was possible to obtain a relative efficiency for the various filters.

The efficiency of the apparatus was found by substituting a card board for the filter and removing it before the charge was transferred to C_2. This was checked several times and found to be eighty

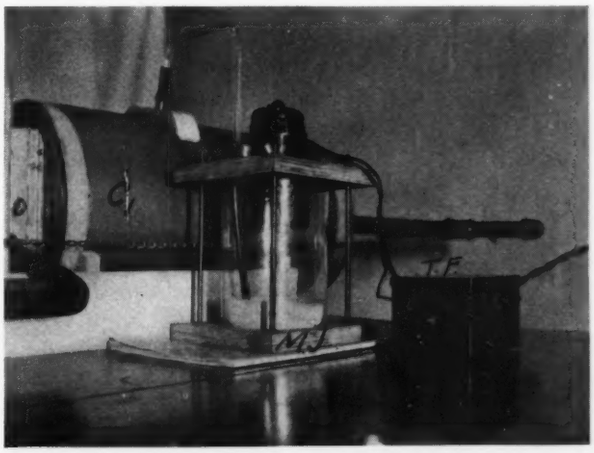


Fig. 10. Closeup of mixing jar showing cylinder 1, (C_1); mixing jar with motor driven mixer, (MJ); transformer for motor, (T.F.).

per cent. It would hardly be fair to figure an absolute efficiency for the filters on this basis.

The ends of both drums were reenforced with five ply fir glued and bolted on. All outlets of the drums were reenforced with wood glued to the drums. All junctions between the drums were reenforced with wood, glued and bolted in place sealed with shellac stick, varnish, and sponge rubber. Mastic tape was used to seal the lids of the cylinders and the filters between the adapters.

The drawing (Figure 8) of the details of the apparatus shows the rack R or chassis for holding the drums. This was sawed in two parts in order to make adjustments for the large filters.

A ground slide "S" is shown with the cross, cut with a diamond pencil.

Operation of Apparatus

The chosen polen or other contaminant was introduced into mixing jar (M. J.) where it was agi-

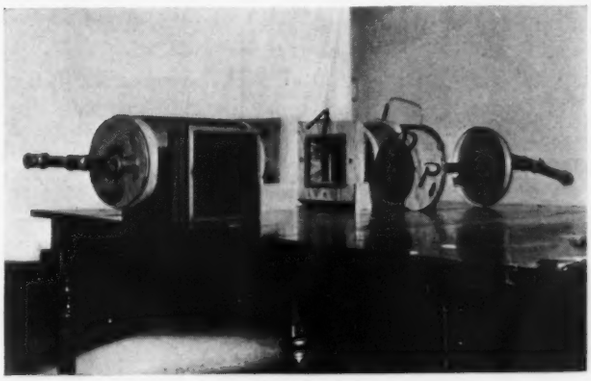


Fig. 11—Cylinder assembly showing, adapter, (A); agitating disc, (D); and piston, (P).

tated by the fan sealed in the top with sponge rubber. The speed of the motor was controlled by the transformer. The glass mixing jar (180 cubic inches) was sealed airtight with sponge rubber. (Figure 10.)

The flanged copper tube and bent glass tube conveyed the contaminated air into the first cylinder C_1 (1472 cubic inches). All junctions of glass tubing were in direct contact, rubber tubing sealed the junctions, but was not used to convey contaminated air as it held pollen and spores through magnetic action. The glass tube into C_1 permitted the investigator to judge the degree of contamination in C_1.

The contaminated air in C_1 was constantly agitated to eliminate stratification and retard settling of contaminant by the 8¼" disc D, with the piston P_1 at the beginning of the stroke. (Figure 11).

A sample of contaminated air (300 cubic centimeters) was drawn from C_1 by decanting 300 cubic centimeters of water from the Wolff jar (W_1). This

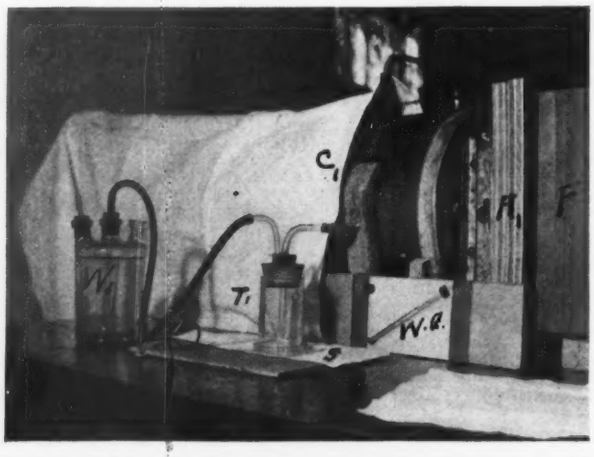


Fig. 12—Assembly ready for test. See text immediately above for explanation of procedure. Parts are—C_1, cylinder 1; W_1, Wolff jar; T_1 flanged testing jar; S, ground etched slide; WG, 20-in. water gauge for checking resistance; A_1, adapter; F, filter being tested.

forced the sample through the double stopped ground flanged testing jar T_1. (Figure 12.)

This jar was affixed to a glass slide ground to fit the flange, sealed with vaseline. The bent glass tube with a ground end was adjusted to within one millimeter of the ground slide at the intersection of the etched cross on the slide. The slide was lightly coated with vaseline and the particles in the sample were deposited in a circular area on the slide. A pinch cock prevented any further admission of air into T_1.

The pistons P_1 and P_2 were joined by pipes when small filters were tested, and chain when large adapters were used. (Figure 13.) The pistons were operated in tandem by a bucket of sand, weighted to give the proper face velocity to meet the specifications of the filter tested. This information was computed by checking the time of fall of various weights attached to the pistons with the aid of a moving picture camera.

Leaks were prevented by sealing the filters and adapters with ribbon sponge rubber. The lids of the cylinders were sealed with scotch tape and the pistons were backed with felt. There was practically no tendency of the contaminated air to escape since the volume of contaminated air in C_1 (.85 cubic foot) was pushed through the filter by P_1 and the piston P_2 of cylinder C_2 drew the air into C_2 at the same rate of speed as it was being removed from C_1, the volume of filtered air in C_2 was the same (.85 cubic foot) as was in C_1.

Immediately a 300 cubic centimeter sample of filtered air was drawn from C_2 by decanting 300 cubic centimeters of water from the Wolff jar (W_2) which is connected to the testing jar T_2 and etched slide S_2 same as explained for cylinder C_1.

The moving picture shows clearly the method of testing the filters.

The time required for performing one run averaged two minutes. The settling of dust particles, is very slow—the settling of the particles is negligible in this period of time.

A water gauge twenty inches long with a 1/100 inch scale was constructed and mounted on the chassis to check the resistance of the various filters tested.

The slides S_1 and S_2 were plaed on a jig fitted to the stage of a Leitz microscope with the center of the etched cross directly under the center of the counting disc in the number five eyepiece. A number ten eyepiece was used for abrasive dust (Al_2O_3 No. 303) and mold spores (Conidia) and (Penicillium Glaucum).

Number three objective was used with the vertical tube set at 160 millimeters, producing a magnification of (50) diameters with number five eyepiece, and a magnification of 100 diameters with a number ten eyepiece.

Counts were taken on the etched coordinate axes of each slide, four in number from the intersection, totalling seventeen fields for each run. Thirty-six

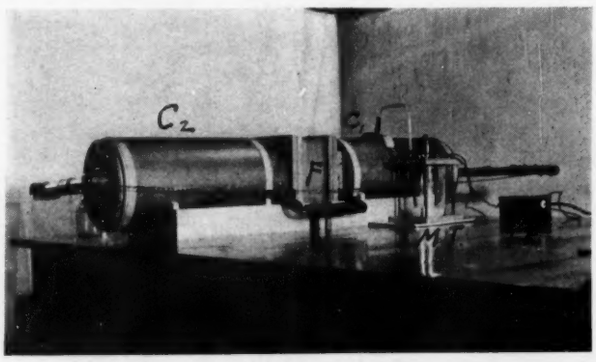


Fig. 13—Assembly for testing small filters (pipe connection for pistons); parts as previously identified.

fields were counted at each station covering .09 square millimeters or 55 square millimeters for the 612 fields for the run. The efficiency was computed by dividing the difference of the counts on S_1 and S_2 by the count on S_1.

Five runs were taken for each filter for each con-

taminant and the average of the efficiencies for the five tests taken as the efficiency for the filter for the contaminant used.

Choice of Contaminant

The measuring of small objects naturally revert to the metric system as the divisions of the inch are too cumbersome for this kind of work. In microscopical work the millimeter is the standard of measurement, a millimeter is subdivided into one thousand equal parts, known as micro-millimeters, or microns for short: one micron therefor is 1/25000 of an inch.

The impurities which contribute to atmospheric pollution include carbon from the combustion of fuels, particles of earth sand, ash, rubber, tires, leather, animal excretion, stone, wood, rust, paper, threads of cotton, wool, and silk, bits of animal and vegetable matter, and pollen.[6]

The most conspicuous sources of atmospheric pollution may be arbitrarily classified according to the size of the particles as dusts, fumes, and smoke. *Dusts* are particles of solid matter varying from 1.0 to 150 microns in size. *Fumes* include particles resulting from chemical processing, combustion, explosion, and distillation, ranging from 0.1 to 1.0 micron in size. *Smoke* is composed of fine soot or carbon particles, less than 0.1 micron in size. Smoke contains unconsumed hydrocarbon gases, sulphur dioxide, sulphuric acid, carbon dioxide, and other industrial gases capable of injuring property, vegetation, and health. Dusts settle without appreciable agglomeration, fumes tend to aggregate, smoke to diffuse. Particles larger than one micron will eventually settle out by gravitation; particles smaller than one micron will remain in suspension as permanent impurities unless they agglomerate to sizes larger than one micron.

[6] *American Society of Heating and Ventilating Engineers Guide* (12th edition; New York: American Society of Heating and Ventilating Engineers Press, 1934). P. 207.

Choice of Filters

To fulfill the essential requirements of clean air, an air cleaner should:

1. Be efficient in the removal of harmful and objectionable impurities in the air, such as dust, dirt, pollens, and bacteria.
2. Be efficient over a considerable range of air velocities.
3. Have a low frictional resistance to air flow, that is, the pressure drop across the filter, measured **in inches** of water, should be as low as possible.
4. Have a large dust-holding capacity without excessive increase of resistance, or have ability to operate so as to keep the resistance constant automatically.
5. Be easy to clean and handle, or clean itself automatically.
6. Leave the air passing through the cleaner free from entrained moisture or changing liquids used in the cleaner.[7]

In this issue the various filters tested have been listed and cross notation made to the test data pages where the filter medium is described.

The types of modern air filters or air cleaners can be classified as follows:[8]

(1) viscous filters;
(2) dry filters;
(3) bag filters;
(4) electric precipitators;
(5) air washers;
(6) centrifugal devices; and
(7) vorticose dust collectors.

The air filters selected for this investigation were the most efficient type for domestic use. The manufacturers were opposed to having their cheaper types subjected to a laboratory test. Only the two types of modern air filters were considered; the viscous filters and the dry filters.

[7] *Ibid.*, p. 217.
[8] James A. Moyer, and Raymond U. Fittz, *op. cit.*, Pp. 68-80.

A.S.T.M. Revised Fuel Oil Specifications

(*Continued from page* 53)

residuum can be reduced to 0.15 per cent to meet certain burner requirements.

The new A. S. T. M. tentative specifications are the same as the latest edition of the Commercial Standard for Fuel Oils, CS 12-38. These fuel oil specifications were first issued as Commercial Standard in 1929 and revised in 1932 and 1934. In connection with the 1934 revision, arrangements were made to coordinate the work of technical committees of A. S. T. M. Committee D-2 with the program of the Division of Trade Standards of the National Bureau of Standards. The A. S. T. M. first issued tentative specifications for fuel oil in 1934. The cooperative arrangements effective in that year have been continued for this latest revision.

The new test for sediment in fuel oil by extraction given in the new tentative specifications is included in the Commercial Standard and has also been published separately by the A. S. T. M. as a tentative standard.

The A. S. T. M. tentative specifications for fuel oil D 396-38T, and the new test method for sediment in fuel oil, D 473-38T, may be obtained from the American Society for Testing Materials, 260 So. Broad Street, Philadelphia, at 25 cents each. The Commercial Standard, CS 12-38, may be obtained from the Superintendent of Documents, Washington, D. C., at five cents.

Heat Conservation in Gas Heated Buildings*

Analysis of Losses

THE heat loss from any structure may be divided into losses due to heat conduction and radiation and losses due to air change. There is an essential difference between these classes. We may reduce the first as far as we like although there is a practical limit to how far we should go. But since a certain amount of air change is necessary to health and comfort, there is an absolute limit to the reduction of losses due to air change in any occupied building beyond which we must not go even if we are able. It is evident that for any structure, there is a necessary heat loss which we cannot seek to reduce. All other losses may be reduced as far as the savings justify the expense. It is our problem to investigate and discuss the ways and means, and find out how far each may be profitably carried.

Before beginning a detailed consideration of conservation measures, it may be well to point out that we have found it convenient in dealing with our problems to use the therm as a common unit in which to express heat requirements, heat loss, or heat saving and heat value in fuels; also, that expressions such as the following are useful in illustrating the relations between quantities with which we are dealing.

Let D = the normal degree days.

Let C = the cost of the fuel, dollars per therm.

Let E = the average over-all efficiency of the heating plant for all the heating season; e.g., the Btu plant for the heating season; e.g., the Btu fired.

Let H = the total heat loss per day per degree difference in temperature expressed in therms.

Let H_s = the saving in heat per day per degree difference in temperature for any given conservation measure expressed in therms.

Let I = the cost of the insulation or other heat conserving measure in dollars.

Some of the relations between these factors are expressed by the following simple formulae:

Heat requirements per season = HD Therms

Heat necessary in fuel for season $= \frac{HD}{E}$ Therms

Cost of fuel for season $= \frac{HCD}{E}$ Dollars

Heat saving per season due to any measure $= H_sD$ Therms

Saving in fuel per season $= \frac{H_sD}{E}$ Therms

Saving in money per season $= \frac{H_sDC}{E}$ Dollars

Return on money invested in any measure for heat conservation $= \frac{H_sCD}{EI}$

It is evident that the saving possible with any conservation measure varies directly as the cost of the fuel and the degree days, and inversely as the over-all efficiency of the application of the fuel. The curves of Figs. 1 and 2 illustrate this in graphic form.

Major Conservation Measures

Broadly speaking, the more important measures for heat conservation fall under the following heads:

1. Reduction of Inside Temperatures
2. Insulation
3. Weatherstripping and Caulking
4. Double Windows
5. Reduction of Air Flow up Flue and from Open Fireplaces

In order to discuss and evaluate the practical results to be obtained, it will be well to have a fairly typical house to use as an illustration.

Let us take a two-story separate dwelling of fairly good frame construction, shingle or clapboard outside, slate roof, with unfurnished, unheated attic. Horizontal cross section 30 feet x 24 feet inside, ceiling height first floor 9 feet, second floor 8 feet. Total contents, not including basement or attic, 12,960 cubic feet.

Let us assume this house to be uninsulated with double hung sash windows, single glass, not weatherstripped. It has a hot water heating system with plain type thermostat.

Table A gives the heat loss data, including areas, conductance coefficients used, and infiltration data for average conditions of seven-mile wind and maximum day with 20-mile wind.

The figures for infiltration losses and savings to be obtained by weatherstripping are based upon an assumption that the house will have 382 linear feet of crack around doors and windows, and that with the seven-mile per hour wind, no weatherstripping, infil-

*Published as Interim Bulletin No. 26, by Commercial Section, American Gas Association, New York, N. Y.

TABLE A

HEAT LOSS DATA TYPICAL HOUSE UNINSULATED

Conduction Losses

	Area Sq. Ft.	Heat Conductance	Loss per Degree per Hour B.t.u.	Loss per Degree per Day B.t.u.	Loss per Degree Per Day Per Cent of Total	Loss Maximum Hour	
						B.t.u.	Per Cent of Total
Glass	311	1.13	351	8,424	26.1	24,570	22.9
Walls (Net)	1,633	.262	427	10,248	31.8	29,890	27.8
Roof	720	.280	201	4,824	14.9	14,070	13.1
Floor*	720	.34	245	5,880	18.2	4,900	4.5
Totals			1,224	29,376	91.0	73,430	68.3

*20° constant temperature difference, between first floor and basement, is used in floor loss figures.

Infiltration Losses

	Average Conditions—7-Mile Wind				Maximum Conditions—20-Mile Wind				
								Loss Max. Hour	
	Volume Cu. Ft. per Hour	Loss B.t.u. per Degree per Hour	Loss B.t.u. per Degree per Day	Loss per Degree per Day Per Cent	Volume Cu. Ft. per Hour	Loss B.t.u. per Degree per Hour	Loss B.t.u. per Degree per Day	B.t.u.	Per Cent of Total
Windows and Doors	4,750	95	2,280	7.1	22,530	450.6	10,814	31,542	29.4
Walls, Roof, Floor	133	2	48	.1	524	10.5	252	735	.7
Opening Doors and Windows	1,200	24	576	1.8	1,200	24.0	576	1,680	1.6
Totals	6,083	121	2,904	9.0	24,254	485.1	11,642	33,957	31.7
Total Conduction and Infiltration Losses			32,280			1,709.0	41,018	107,387	

TABLE B

SUMMARY OF POSSIBLE HEAT SAVINGS

Typical House

	First Cost Gross Dollars	Savings B.t.u.		Saving Per Cent of Total		Saving in Htg. Plant Cost Dollars	Net First Cost Dollars	Gross Annual Saving Operating Cost	Annual Depreciation Operating Expense Dollars	Annual Operating Saving Dollars	Return on Net Investment Per Cent	In House Already Built with No Saving in Htg. Plant	
		Maximum Hour	Per Degree per Day	Maximum Hour	Per Degree per Day							First Cost Dollars	Return on Gross Cost Per Cent
Clock on Thermostat	$ 20.00				7.5	$ 69.00	$20.00	$16.03	$ 2.40	$13.65	68.	$ 20.00	68.
Weatherstripping	100.00	12,740	672	11.8	1.6		31.00	4.40	0.00	4.40	14.	120.00	3.7
Double Windows and Storm Doors	100.00	25,368	4,982	23.6	12.1	121.00	21.00	35.25	13.00	22.25		120.00	18.5
Insulation in Walls No. 1	196.00	22,540	7,728	21.	18.9	107.00	89.00	51.14	0.00	51.14	57.	260.00	19.6
Insulation in Walls No. 2	130.00	12,810	4,490	12.	14.0	61.00	69.00	30.00	0.00	30.00	43.5		
Insulation in Roof No. 1	86.00	10,584	3,629	10.6	11.2	51.00	35.00	24.00	0.00	24.00	68.6	115.00	20.9
Insulation in Roof No. 2	57.50	6,050	2,073	5.6	6.4	30.00	27.50	14.00	0.00	14.00	51.0		

Insulation No. 1—4" rock wool—cost if placed when house is built 12 cents per sq. ft. Cost if blown in later 16 cents per sq. ft. Conductance .27 B.t.u. per sq. ft. per degree per in.

Insulation No. 2—A board insulation one inch thick, used as plaster base costing 8 cents per sq. ft., installed after deducting for common lath base replaced by it. .Conductance .34 B.t.u. per sq. ft. per degree per in..

TABLE C

SAVING DUE TO VARYING THICKNESS OF INSULATION

Added to Wall or Roof Having Conductance of .27 Insulation

Thickness of Insulation	Loss per Day per Degree Therms	Cost of Insulation Dollars	Heat Loss Max. Hour Therms	Saving Max. Hour Therms	Saving per Day per Degree Therms	Saving Heating Plant Cost Dollars	Net Cost Insulation Dollars	Annual Operating Cost Dollars	Annual Operating Savings Dollars	Per Cent on Gross Cost Dollars	Per Cent on Net Cost Dollars
None	.065		.189					$43.00			
1"	.032	$ 64.00	.094	.095	.033	$45.00	$ 19.00	21.50	$21.50	33.6	113.
2"	.022	102.00	.063	.126	.043	61.00	41.00	14.30	28.70	28.1	70.
3"	.016	140.00	.047	.142	.049	68.00	72.00	10.70	32.30	23.1	44.8
4"	.013	178.00	.038	.151	.052	72.00	106.00	8.60	34.40	19.3	32.4
6"	.009	255.00	.027	.162	.056	76.00	179.00	6.10	36.90	14.5	20.6

The calculations summarized in this table are based upon rock wool or equivalent insulation with a conductance of .27 Btu. per square foot per degree per hour for one inch thickness. 10 lbs. per cu. ft., price $80.00 per ton; fuel 10 cents per therm; overall fuel efficiency 68 per cent; degree days 4,500, maximum hour is based on 0 to 70°; all figures are for 1,000 sq. ft. Labor and other expense of placing insulation has been taken at 3 cents per sq. ft. for 1" thickness and one-half cent added for each additional inch.

tration is 12.5 cubic feet per foot of crack per hour; with weatherstripping 8.8. For a 20-mile wind with no weatherstripping, infiltration is taken as 59.3 cubic feet per foot of crack per hour, while with weatherstripping this figure is reduced to 35.5.

In estimating the saving due to double windows and storm doors, we have assumed a saving in infiltration losses the same as for weatherstripping, plus a saving based on the conductance for the glass area being reduced from 1.13 to .55 Btu's per square foot per degree per hour. The glass area is assumed to be 311 square feet.

The method of figuring floor loss is possibly open to some criticism, but is adopted here for the sake of

simplicity in an example that is being used to illustrate the economics of heat conservation rather than the calculation of heat loss.

Let us assume that our house will be heated by a gas boiler with gas costing 10 cents per therm, and that the average degree days for the locality are 4,500. Then D = 4,500 and C = .1. We will assume that E = 70%, which is a very conservative figure, even including the spring and fall heating when over-all efficiency is necessarily very low. From Table A, H = .32280.

Then, the total heat requirements per season = .32280 × 4,500 = 1,452.6 Therms

The heat to be supplied by the gas will be:

$$\frac{145.2}{.70} = 2{,}074.3 \text{ Therms}$$

The cost per season will be $207.43 for the house as set up without any particular attempt at heat conservation.

We are now ready to study the possible heat savings. Table B shows the cost of various conservation measures both gross and net, the saving in heat, the saving in operating costs and the return on the gross and net costs. Now with the concrete example before us we can discuss each saving and endeavor to show what return we may expect it to yield upon the money invested in it.

It is first necessary to point out that the return on our investment in many cases depends upon whether we plan for the conservation measure before the house is built or adopt it later. If we know we are going to use insulation, we can install a smaller boiler and less radiation and deduct the saving on heating plant from the cost of insulation, arriving at a net cost much lower than the gross cost of the insulation. If, however, our plant is already installed, we cannot recover anything on the excess capacity that will exist after insulation is put in, and we must calculate our return on the gross cost of insulation or whatever other conservation measure we are considering.

Temperature Set-Back at Night

The question of the saving that can be effected by using a clock thermostat or timer to lower the temperature carried during the night hours has long been debated. Many words have been wasted and much ink has been spilt by each side of the controversy. There is a fairly general agreement that there is a saving. The question has been whether the saving that could be obtained was enough to justify the extra cost and complication introduced by the use of the clock. We believe that enough reliable data have now been collected to prove that, except in the case of very cheap fuels, the set-back is decidedly worth while.

The saving is due not only to maintaining a lower temperature for six or eight hours out of the 24, but also to the fact that on steam vapor and hot water systems, the occupants of the house leave their radiators on and open their windows while sleeping. Therefore, if the thermostat is left at the day temperature, shortly after the people have retired it will call for heat. The radiators in the bedrooms with open windows will be filled with steam or hot water, resulting in a very high rate of heat dissipation and the heat so rapidly dissipated will immediately escape through the windows. We believe that the conclusion that a very substantial saving can be secured by the set-back is inescapable, and that the best data available indicate that a conservative estimate of the average saving for steam and hot water installations, due to proper set-back, is at least 7.5% of the total gas that would be burned if the set-back were not used. This figure has been used in our calculations. It is possible that, for warm air systems, the saving is somewhat less.

The question of how great a set-back will yield the best results is, also, one that has been hotly debated. It will differ somewhat for different types of buildings and different climates. For the average conditions we are using in our illustration, we believe a set-back of 10 to 12 degrees gives the best results.

It is evident that a set-back at night cannot reduce the maximum hour's demand for heat. It is possible to argue that it might increase the rate at which heat would have to be supplied when bringing the temperature up in the morning and would, therefore, increase the size of the heating plant. We do not believe, however, that it is general practice to vary the size of boiler and radiators installed with regard to whether a clock type thermostat is to be used or not, but this might very properly be considered.

On the basis of a $20 extra cost for a clock type thermostat and 7.5% saving in fuel with gas at 10 cents a therm, and after allowing for maintenance and depreciation on the clock, we have the very handsome return on our investment of 68%, which is by far the greatest proportional saving that any of the heat conservation measures will yield. The most serious disadvantage of the clock type is the additional service it imposes on the gas company.

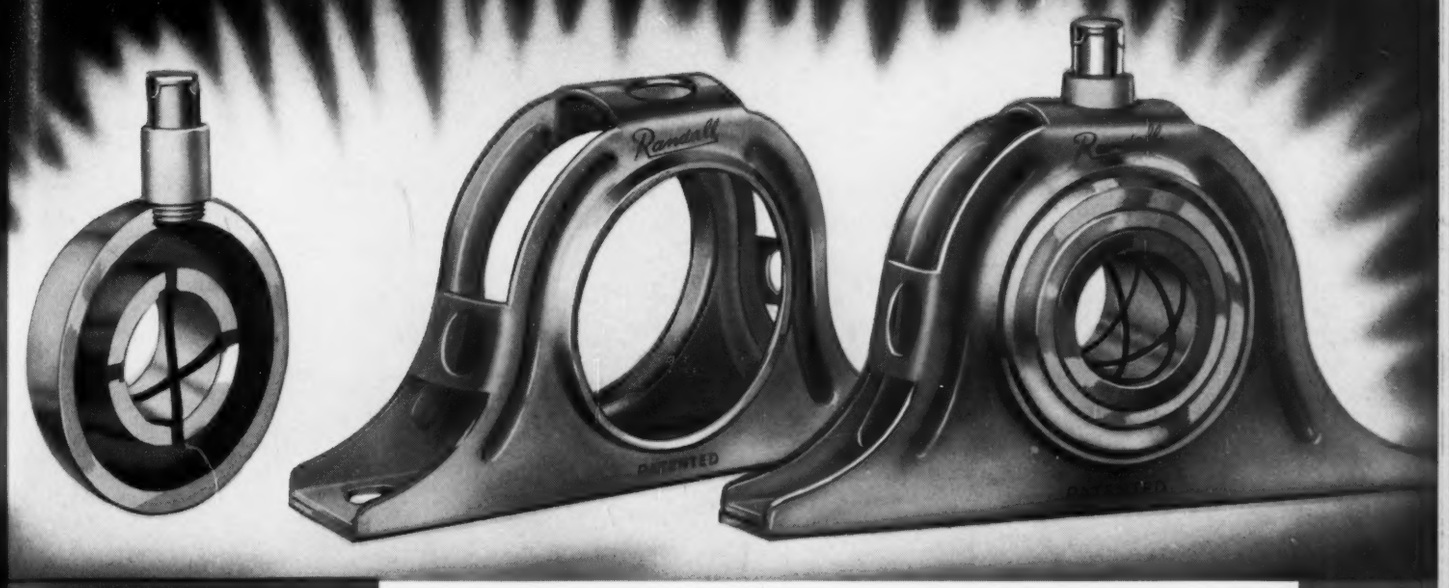
Weatherstripping

The question of the efficacy of weatherstripping has, also, been very much discussed. There still remains a considerable amount of uncertainty in the data about window leakage. It is not within the scope of this report to attempt to discuss the final accuracy of such data or to deal with the technique of calculating such losses. There are, however, several points that we have not seen stated clearly in any of the literature on the subject and which it may be worth while to attempt to demonstrate here.

If we refer to the data presented in the 1933 Guide, published by the A. S. H. V. E., we see that the saving of infiltration loss around window sash, due to weatherstripping, is much greater in proportion for the higher wind velocities. The saving for a 20-mile wind is more than four times as great as that for a five-mile wind. In estimating the maximum heat requirements for any structure, we believe that infiltration losses should be based on the 20-mile wind. These maximum losses will determine the size of boiler and radiation

(*Continued on page* 96)

ONE-PIECE STEEL HOUSING PILLOW BLOCK



Randall

presents to industry

a new low-cost PILLOW BLOCK

IMPORTANT FEATURES

1. Low cost
2. Quiet
3. Constant self-aligning
4. One-piece steel housing
5. Selective mounting positions
6. Cadmium plated finish
7. Only 3 parts
8. Assembled without adjustment
9. One-third less weight
10. Lower shipping costs

Randall Pillow Blocks have long been the leaders in the furnace blower and air conditioning field. Their long life and satisfactory operation in the industry demonstrate their high quality and carefully engineered design.

Building on this excellent foundation, Randall has added to the line a new one-piece steel housing, self-aligning, self-lubricating pillow block at a lower price than any Randall unit that has ever been introduced.

The unique patented design of the one-piece steel housing is simple yet sturdy and its low manufacturing and assembly cost has enabled us to offer this bearing in a low price range. The new machined cast iron ball with large reservoir is assembled ready for use in the one-piece steel housing complete with oiler shown. The entire assembly is attractively cadmium plated to resist corrosion.

This bearing is interchangeable with all other Randall Pillow Blocks. It has been under exhaustive tests for the past two years. Now it is offered to you with the certainty that it will meet your needs completely at a considerable saving in cost. Read the list of features.

The new pillow block will be put into production about December 1 and will be available in shaft sizes from ½" to 1". Our engineers will be glad to cooperate with your designing and development departments. Write for 1939 catalog of the complete Randall line, with new lower prices.

RANDALL GRAPHITE PRODUCTS CORPORATION

Dept. 1111, 609 W. Lake St. Chicago, Ill.

Yes • • • BARBER has added Round Burner "Flexibility" to its Many Improvements!

(Above) burner set at smallest diameter, ready for installation in boiler.

•

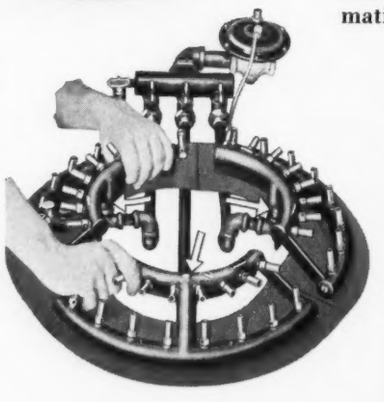
(Right) installer swings the 2 units, connected to outer control lines, outward to required diameter.

•

(Right) burner assembly spread to maximum diameter. Short nipples are furnished for boilers, longer nipples for furnaces.

•

Baffle plates are easily trimmed to fit. No refractories needed.



As usual, BARBER BURNER is out in front with a new feature in *round burner* design which will be instantly appreciated by heating dealers and gas experts. It's the Barber "expansion principle"—which enables round conversion burner assemblies to be quickly and properly adjusted, at time of installation, to the grate diameter of the furnace or boiler. *It means that you can carry a smaller stock.*

For example, as shown in the illustrations of No. 324 Burner, this model has a range of adjustment for combustion chamber diameters of 18″ to 20½″. All Barber Round Conversion Burners are now furnished with this adjustment feature, and can be contracted or expanded to dimensions shown in Barber Catalog.

This unique betterment, exclusive with Barber, applies a new significance to the idea of "tailor-made" gas conversion burners—since the furnace can now be *accurately* fitted with the *proper* unit for efficient heating. It's a sure thing there will now be many more furnaces and boilers converted to GAS—and many new dealers and distributors converted to Barber Burners! Why not write today for full information?

Round Burner models come in 8 sizes for grates 12″ to 34″ in diameter. There is also a wide range of sizes for oblong grates. Patented BARBER Jets insure complete combustion, with a "scrubbing" flame action on walls of firebox. Baltimore Safety Pilot. Listed in A. G. A. Directory of Approved Appliances. Ask for Catalog and Price List on Conversion Burners for Furnaces and Boilers, Burner Units for Gas Appliances, and Gas Pressure Regulators. We supply sales folders, at your request, for mailing to your customers.

THE BARBER GAS BURNER COMPANY

3704 Superior Avenue
Cleveland, Ohio

•

Address Michigan Inquiries to
The Barber Gas Burner Company of Michigan
4475 Cass Ave., Detroit, Michigan

BARBER *Automatic* JET GAS BURNERS

The Warm Air Heating Ordinance of Salem, Oregon

Since January, 1936, we have published sections of the heating ordinance, of some city, in practically every issue. During this time the codes of Minneapolis; Ft. Wayne, Indiana; Toledo, Ohio; Sioux City, Iowa, have been published in full. This ordinance of Salem, Oregon, has been in effect since 1935 and, while not as detailed as some others, is a satisfactory code. Of particular interest are the sections covering the rating of furnaces.

AN ORDINANCE to regulate the installation of warm air heating systems in residences and other buildings.

BE IT ORDAINED BY THE COMMON COUNCIL OF THE CITY OF SALEM, OREGON:

The provisions of this ordinance shall be held to be the minimum requirements adopted for the protection of health, welfare, sanitation, and safety of the community and for the protection of the ultimate purchaser and user of the heating plant.

Gravity warm air heating systems shall consist of one or more warm air furnaces, enclosed within casings, together with necessary appurtenances thereto, consisting of warm air pipes and fittings, cold air or recirculating pipes, ducts, boxes, and fittings, smoke pipe and fittings, registers, borders, faces, and grills, the same being intended for heating buildings in which they may be installed.

Mechanical warm air heating systems shall consist of one or more warm air furnaces within individual casings or within a common casing, one or more motor driven blowers, smoke or vent pipes, individual leader pipes or trunk line systems with necessary control dampers for supply and return air registers, faces, grills, and with provision for other appurtenances such as filters, air washers, ozonators, humidifiers, etc., as may be desired; furthermore, manual or automatic controls for any or all apparatus installed, the same being intended for heating or conditioning the air in buildings in which they may be installed.

ARTICLE I

Section 1. It shall be unlawful for any person, persons, firm, or corporation to construct, replace, or install any warm air heating furnace or appurtenance thereto within the city of Salem, Oregon, without first obtaining from the building inspection department a permit to do such work, for which said person, firm, or corporation shall pay to said city of Salem for the use of said City, for each furnace installed, renewed, or remodelled the sum of fifty cents and for each warm air outlet or stack head installed, remodelled, or renewed the sum of twenty-five cents. Where more than one room is to be heated by one warm air register, the price charged per permit shall be fifty cents for the furnace and twenty-five cents for each room to be heated.

Section 2. It shall be unlawful to sell, vend, or install any warm air furnaces unless the manufacturer of said furnace has filed with the building inspection department proof that the capacity of such furnace has been computed in accordance with the furnace rating formulas in Article III or Article IV.

ARTICLE II

Section 1. It shall be the duty of the building inspection department to inspect all warm air furnaces, and appurtenances thereto, hereafter installed or constructed in conformity to the provisions of this ordinance. The expenses of such inspection shall be paid out of the fees received for permits to install or construct such warm air furnaces and appurtenances, and any balance remaining in the amount so paid in any calendar year, not used for inspection purposes aforesaid, shall be turned in to the building inspection fund.

Section 2. Inspection of new work shall be made as follows: When such work has proceeded to where the stacks to upper floors and heads for all side wall registers have been installed, and the boots have been connected thereto, the contractor, or person obtaining permit for such work, shall notify the inspection department, who shall make or cause to be made an inspection of such work. Upon finding that the work complies with the terms of this ordinance in all respects, there shall be affixed by said inspector or his representative to each stack or register head a certificate stating that the work complies with the ordinance relating thereto.

Final inspection of the plant shall be made after the whole is connected and ready to operate.

Section 3. No heating permits shall be required for minor repair work. By minor repair work is meant the incidental repairs to furnace, which shall not affect the general action of the system, such as removal of grates and smoke pipes, and resetting old furnaces in the same locations; and changing or renewing single warm air pipes in basements; but where stacks, register boxes, or fittings are renewed or installed, a permit shall be required.

Section 4. It shall be unlawful for any person to lath over, plaster, or cover any warm air heating work before such work has been inspected and certificates above referred to have been attached. The building inspection department shall have the right and authority to remove or order removed all such work as lath, plaster and other covering which may have been placed over such work before same has been inspected. The person, persons, firm, or corporation ordering or causing such work to be covered or in any way violating any section of this ordinance herein set forth, shall upon conviction, be subject to the penalties set for violation of the terms of this ordinance.

Section 5. The building inspection department shall have access at all times to the work covered in this ordinance, also methods of work, etc., necessary to obtain the results sought by this ordinance. He shall also have jurisdiction in cases which may arise which are not fully treated in this ordinance.

ARTICLE III

This article pertains only to gravity warm air heating systems.

Section 1. The size of the basement warm air pipe to each room shall be determined as follows: [Editor's Note: This Table A is not the same Table A of the Stand-

ard Code. This table is based on an indoor-outdoor temperature difference of 60 degrees.]

(a). For each first floor room, divide the square feet of exposed glass by 12; divide the square feet of net exposed wall, ceiling or floor by the applicable factor in Table A; divide the cubic contents by 1000; add together the above and multiply by 9. The result is the area of the basement pipe in square inches.

(b). For each second floor room, divide the square feet of exposed glass by 12; divide the square feet of net exposed wall, ceiling, or floor by the applicable factor in Table A; divide the cubic contents by 1000; add together the above and multiply by 6. The result is the area of the basement pipe in square inches.

(c.) For each third floor room(divide the square feet of exposed wall, ceiling, or floor by the applicable factor in Table A; divide the cubic contents by 1000; add together the above and multiply by 5; the result is the area of the basement pipe in square inches.

Section 2. No basement warm air pipe less than 8 inches in diameter shall be used. If a basement warm air pipe figures not to exceed 10 per cent greater in area than any commercial size, the nearest commercial size shall be used, provided, however, that the total leader pipe area for each floor shall in no case be less than the total calculated requirements according to section 1.

Section 3. Basement warm air pipes shall be run comparatively straight and not more than 16 feet in length. When a warm air pipe exceeds 12 feet in length or has more than two 90-degree turns, the next larger commercial size pipe shall be used.

Section 4. Each wall stack, fitting, or connection, to a first floor room shall maintain a free area equal to the basement pipe leading to it.

Section 5. Each wall stack, floor fitting, or connection to a second floor room shall not have less than 70 per cent of the calculated basement pipe area as determined in section 1 (b), except in remodelled or furnace replacement installations.

Section 6. Each wall stack, floor fitting, or connection to a third floor room shall have not less than 70 per cent of the calculated basement pipe area as determined in section 1 (c), except in remodelled or furnace replacement installations.

Section 7(a). Where two or more rooms are heated from the same basement pipe and stack, the area of such basement pipe and stack shall equal the combined areas as determined in section 1.

(b). Transition from warm air pipes to stacks and register heads shall be made with transition elbows or boots.

Section 8. Each register shall have a free area at least equal to the area of the basement pipe leading to it and shall be of the approximate width of the stack or fitting to which it is attached.

Section 9(a). The furnace installed shall have a capacity expressed in square inches of pipe area at least equal to the total obtained by adding together the basement warm air pipe areas required, as calculated in section 1. The capacity of the furnace shall be determined from the following formula:

Rating in square inches for grate furnaces = 1.75 G (1-0.02 (R-20)).

Rating in square inches for grateless furnaces = 0.9 G (1-0.02(R-20)).

in which G = grate area in square inches, which shall be the area of the fire pot at the grate level, its most restricted area; R = ratio of heating surface to grate area; 1.75 and 0.9 = constants based on a furnace having 20 square feet of heating surface for each square foot of grate area.

(b). Heating surface shall be construed to mean all surfaces of the furnace body inside the casing above the level of the grate, in contact with fire, flame, or hot gases on one side and circulating air on the other side. In furnaces that have no grates, 50 per cent of the area covered by the fire box lining shall be added to the area above the lining in figuring the heating surface.

(c). Grate area shall be construed to mean the clear area of the opening in which grates are placed, or the area of the bottom of the fuel bed. On horizontal furnaces having no grates, a horizontal line three inches above the bottom of the firebox shall determine the grate area.

(*Continued on page* 94)

TABLE A

Construction of Exposed Wall			Factor
No. 1.	(a).	Frame wall constructed of siding, paper sheathing, studding, lath and plaster	70
	(b).	Same as 1-a, but substituting ½-inch fibrous board or equivalent for the lath	93
	(c).	Same as 1-a, with addition of 3½-inch of insulating fill between studding	163
		For stucco on frame walls, use the same values as for frame with siding.	
No. 2.		Nine-inch brick wall plastered on one side	47
No. 3.	(a).	Nine-inch brick wall, air space, furred, and plastered	66
	(b).	Same as 3-a, but substituting ½-inch fibrous board or its equivalent for the lath	98
No. 4.		Thirteen-inch brick wall plastered on one side	60
No. 5.	(a).	Thirteen-inch brick wall, air space, furred, and plastered	80
	(b).	Same as 5-a, but substituting ½-inch fibrous board or its equivalent for the lath	113
No. 6.		Four-inch brick, 4 or 8-inch hollow tile, plastered	66
No. 7.	(a).	Four-inch brick, paper, sheathing, studding, lath and plaster	67
	(b).	Same as 7-a, but substituting ½-inch fibrous board or equivalent for the lath	98
	(c).	Same as 7-a, but with the addition of 3½ inches of insulating fill between studding	185
No. 8.		Stucco on 8-inch hollow tile, plaster	56
No. 9.	(a).	Stucco on 8-inch hollow tile, furred and plastered	76
	(b).	Same as 9-a, but substituting ½-inch fibrous board or equivalent for the lath	111
		Ceilings with attic spaces above.	
No. 10.	(a).	Lath and plaster without floor above	58
	(b).	Same as 10-a, but substituting ½-inch fibrous board or equivalent for the lath	82
	(c).	Same as 10-a, with addition of ½-inch fibrous board or equivalent nailed on top of joists	105
	(d).	Same as 10-a, with addition of 3½-inch insulating fill between joists	175
No. 11.	(a).	Lath and plaster with tight floor above	105
	(b).	Same as 11-a, but substituting ½-inch fibrous board or equivalent for the lath	121
	(c).	Same as 11-a, with addition of 3½-inch insulating fill between joist	214
No. 12.	(a).	Metal without floor above	47
	(b).	Same as 12-a, with additional ½-inch fibrous board or equivalent between metal and joists	76
	(c).	Same as 12-a, with addition of ½-inch fibrous board or equivalent fastened on top of joists	99
	(d).	Same as 12-a, with addition of 3½-inch insulating fill between joists	170
No. 13.	(a).	Metal with tight floor above	87
	(b).	Same as 13-a, with addition of ½-inch fibrous board or equivalent fastened on top of joists	111
	(c).	Same as 13-a, with addition of 3½-inch insulating fill between joists	205
		Ceilings without attic spaces above (Parts of roofs).	
No. 14.	(a).	Lath, plaster, rafter, sheathing, any type of shingles or roofing	67
	(b).	Same as 14-a, but substituting ½-inch fibrous board or equivalent for the lath	86
	(c).	Same as 14-a, with addition of 3½-inch insulating fill	152
		Floors over exposed or unheated spaces.	
No. 15.	(a).	Double floor on joists	49
	(b).	Same as 15-a, with addition of ½-inch fibrous board fastened to bottom of joists	102
	(c).	Same as 15-a, with sheathing fastened to bottom of joists and with addition of 3½ inches of insulating fill between joists	163

Note 1. In obtaining the glass surface use full casement openings. An outside door is figured as glass.

Note 2. To obtain net outside wall, multiply height by width and deduct all windows and outside doors as obtained in Note 1. For all rooms with attic spaces immediately above, full ceiling areas shall be taken into account using factors in Table A. Floors over unheated spaces shall be taken into account, using the factors of Table A. For walls and doors between heated and unheated spaces, use 50 per cent of similar outside exposure.

National

President L. R. Taylor of the National Warm Air Heating and Air Conditioning Association has announced the plans, to date, for that organization's next convention, which is to be held in the Netherland-Plaza Hotel, Cincinnati, Ohio, December 12-14, 1938.

Mr. Taylor emphasizes the fact that at this meeting the silver anniversary of the Association's 25 years of continuous and successful service will be appropriately celebrated and that business conditions and new developments in the Industry will make the sessions of the convention important and helpful to every manufacturer, jobber, dealer and engineer in the business, all of whom are most cordially invited to be present. A capacity crowd as usual is certain.

Monday, December 12, will be devoted to meetings of the Association's Board of Directors and committees. The convention sessions open Tuesday morning, December 13, at 10 o'clock, during which the society's past presidents will furnish an unusual number.

Some of the other subjects and speakers will be as follows:

"Multiple Management," by Charles P. McCormick, Baltimore, Md.
Charles B. Hook, president National Manufacturers Association, president of the Armco Company.
A special report from the Installation Codes Committee by B. F. McLouth, chairman.
Fred S. Wallace, Federal Housing Administration, Cincinnati, Ohio
J. Earle Maynard, chairman of the Associations Federal Housing Relations Committee.
"The Standard Test Code for Fans," by L. O. Monroe, Detroit, Mich.
"Continuous Blower Operation," by G. W. Denges, Cincinnati, Ohio.
"Use and Standardization of Pre-Fabricated Ducts," by Perl S. Miller, Columbus, Ohio.
"The Use of Coke with Warm Air Equipment," by H. R. Rost, Cincinnati, Ohio.
"Contented Customers," by Arthur W. Wrieden of Syracuse, N. Y.

The Research Session will occupy Wednesday morning and will be in charge of the Research Advisory Committee, Professor Kratz speaking on the "Significance of Resistance in a Forced Air System," and Professor Konzo presenting a resumé of "Studies of Summer Cooling During 1938," and advance information relative to our new volume, "Forced Air Heating."

Tuesday evening the beautiful Pavilion Caprice in the Netherland-Plaza Hotel is to be the scene of an alluring banquet and a fascinating and gorgeous entertainment, with Joseph A. Stermer as master of ceremonies. This event has been meticulously arranged by the Cincinnati committee.

Door prizes will be provided for each session.

The complete program will be distributed well in advance of the convention dates.

Allen W. Williams, Managing Director.

◆

Chicago

The bi-monthly meeting of the Furnace-Air Conditioning and Sheet Metal Institute was held at 2857 Belmont Avenue, October 27, 1938. Discussion was continued on the cost and time study program on furnace, blower and repair work, which offers valuable data on various sheet metal working operations. It was announced that members could still get furnace study sheets to assist them in working out the problem.

Plans are now being made for the annual president and ladies night to be held early in December. Because the one held last year was such a tremendous success, Rudy Guenther, president of the Institute, looks for another big evening this year. Tickets are now available, and early reservations are suggested.

Plans for the 1938-1939 Educational Program started November 10 with Bob Schmeider of Milcor in charge.

◆

Wisconsin

The Board of Directors of the Master Sheet Metal, Heating, Ventilating and Air Conditioning Contractors Association, Inc., of Wisconsin met on October 7 and was called to order by Vice President Walter Arndt in the absence of President R. F. Gehrke.

A communication from the Wisconsin Construction Industries' Advisory Committee, relating to the activities of that organization, was read and discussed.

Considerable time was devoted to the membership status. Chairman Kramer suggested that a committee of size be appointed for and during convention time to actively solicit members and function in any manner for the best interest of membership increase. Treasurer Goethel reported and suggested that the secretary canvass all old members and ask them to cooperate in the yearly endeavors for the improvement of the industry.

Secretary Biersach reported the happenings at the Toledo conference of the Secretaries' Conference, and stated that the next problem of vital importance to be considered was the unit ventilator, which seems to be invading the field and destroying some sheet metal work. Secretary Biersach also reported on the National Association status at the present time. Inflammable boards and Celotex was also given attention, and labor situations were discussed. The next meeting will be in either St. Louis or Cincinnati. Representatives of American Iron & Steel Institute and the National Hardware and Jobbers Association are to confer with the Conference on problems.

Arrangements have been made for exhibits at the February convention—fourteen in number at $20 per space on the mezzanine floor adjacent to the convention hall. Thirty-five advertisers have been contacted for the annual Year Book. Registration fees for the convention were established at $2.00. Suggestions were offered to have a dinner dance with floor show at which $1.00 per plate will be charged for ladies. Booth dividers were discussed. Special badges and tables for the charter members and past officers were suggested at the banquet dinner dance.

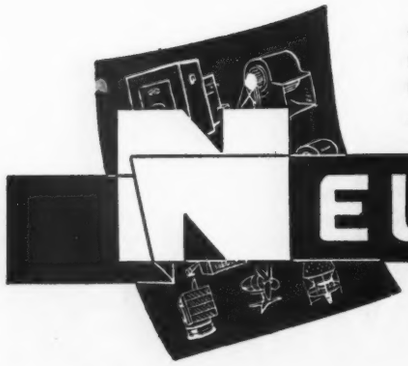
The convention committee consists of:

Honorary Chairmen:	Paul L. Biersach
	Alfred C. Goethel
Active Committee:	Rob't T. Schomann, Chairman
	Martin Schaar
	Herman Reinke
	Frank Kramer

Director Wallig invited the Board to attend the Kenosha meeting on the evening of October 24. Treasurer Goethel stressed the necessity of membership increase and income.

Paul Biersach, Secretary.

(*Continued on page 78*)



NEW PRODUCTS

For your convenience a number has been assigned each item. Check the items in which you are interested on the coupon on page 92 and mail to us. Complete information will be forwarded.

● Indicates product not listed in 1938 Directory.

△ Indicates product and manufacturer not listed in 1938 Directory.

227—New Pillow Block

Randall Graphite Products Corp., 609 W. Lake St., Chicago, announces another advanced pillow block.

Its important improvement, they say, is in construction detail which permits lowered manufacturing costs. It has a one-piece steel housing that saves one-third in weight, yet provides ample

strength for any use. A new spherical precision machined cast iron ball has increased oil reservoir capacity. It is self-aligning and turns on its horizontal axis so that by removing and reinserting the oil cup it can be mounted in any of four positions. The entire assembly is cadmium plated.

The pillow block illustrated is shown with a large oil cup which holds a greater quantity of oil.

◆

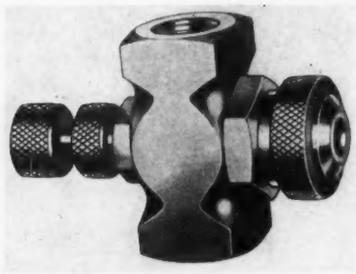
228—Ridge Ventilator

Century Fan & Ventilator Company, 312 East 39th St., New York City, announces the Century ridge ventilator—one continuous unit the full length of building for large working areas.

An inner baffle prevents back drafts and increases the suction by the wind action. The inverted cone directs the exhausted air continuously upward with the least possible resistance. The inverted cone also acts as a damper. When cable is released both sides of cone drop by gravity completely closing the airshaft. Damper is positive in action and requires no attention as bearing surfaces are of self lubricating bronze. Sections are 10 ft. in length and dovetail into cleats forming any desired length without cutting or fitting on the job. End sections are furnished with finishing caps.

▲ 229—Humidifying Nozzle

Spraying Systems Co., 4922 W. Grand Avenue, Chicago, has just placed on the market a pneumatic automizing nozzle for humidifying, in-



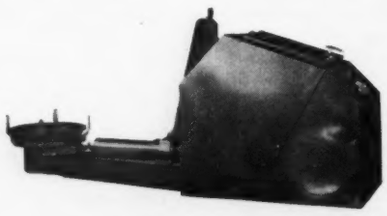
dustrial and chemical processes, paper and textile web spraying. It is of sturdy construction, accurately machined and is now available with externally mixed round spray, internally mixed round spray and internally mixed flat spray.

◆

● 230—The Carrier Stoker

Carrier Corporation, Syracuse, N. Y., announces in two new illustrated folders their first coal fired automatic heating and air conditioning equipment. One covers the use of the Carrier automatic stoker for anthracite coal and the other for bituminous.

The Carrier stoker may be used either with the Carrier automatic furnace, which provides year 'round in-

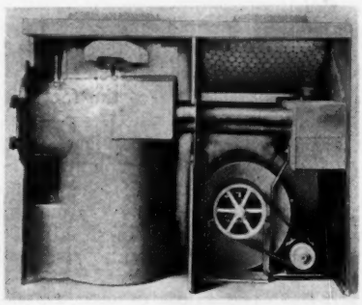


stantaneous hot water or it may be installed in an existing boiler.

These new developments bring the economies of coal as a fuel for use in connection with air conditioning. The cork screw, coal feed propeller is used to fuel the fire and at the same time, produce efficient combustion by the distribution of air throughout the firebed. The Carrier automatic stoker is completely enclosed and is finished in taupe gloss with chrome hardware. The hopper is of welded, seamless, copper-bearing steel with tapered sides for constant coal supply.

231—Special—80 Directaire

Fitzgibbons Boiler Company, Inc., 101 Park Avenue, New York City, announces a new direct-fired air conditioner for the small home, built entirely of copper-bearing boiler plate steel, electrically welded joints and



seams, removable filters, and the new Flotrol Automatic June humidifier as standard equipment; in two sizes—80,000 and 100,000 Btu at the bonnet.

This special-80 Directaire is designed for either oil, gas or automatic stokers and may be furnished with an enclosing jacket or standard jacket. The makers say it is quiet in operation, rapid in its heat transfer, efficient in its performance, compact and quickly installed. It supplements the standard line of direct-fired air conditioners known as the Fitzgibbons Directaire.

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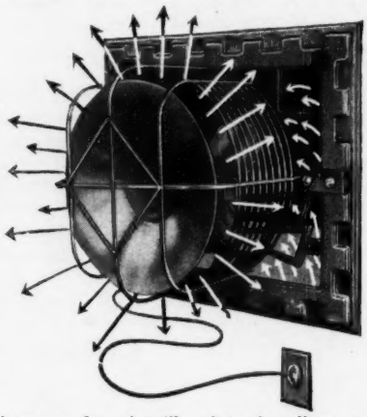
● 232—Deflecto Registair

Kisco Company, Inc., 4414 W. Papin St., St. Louis, Missouri, has recently developed the Kisco "Deflecto" Registair, which is primarily a heat



booster for the "hard to heat" rooms. It is fastened to the register in the room which is chilly, plugged into an electric connection, and draws the static heat from the furnace pipes and distributes it throughout the room.

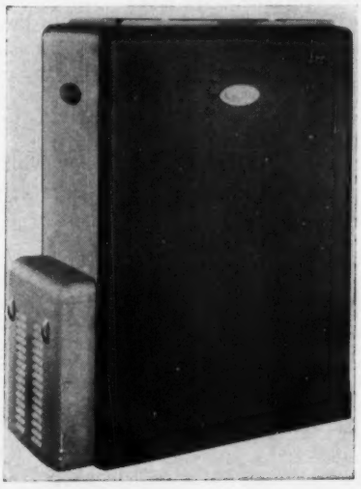
New Products . . . . . .

For your convenience in obtaining information regarding these items, use the coupon on page 92.

233—Home Air Conditioning

The Carrier Corporation, Syracuse, N. Y., announces a new direct-fired home air conditioner designed for the low-priced home.

Styled for basement or first floor location, the new unit is a complete



self-contained air conditioner. It is finished in a combination of colors, taupe and silver.

The Carrier direct-fired equipment takes up only 11 square feet of floor space, operates on either gas or oil with a "tear drop" heat interchanger which assures even heating.

For complete year round air conditioning, a Carrier matched cooling unit of the self contained type is provided.

◆

234—Motorstokor

Motorstokor, Div. Hershey Machine & Foundry Co., Manheim, Pa., after 18 months' development, announces a new series of complete stokers, priced to offer direct competition in installed price with oil and gas burners. Making

full use of the buckwheat and rice sizes of anthracite which are a third less costly than any other fuel burned in anthracite markets, the new Motorstokor No. 10 is smaller, attractive, and priced low.

Within the red and black streamlined cover is a direct-from-bin feed pipe adjustable over an angle of 180 deg., a quiet fan, a ventilated coal-feed tube which prevents gases, back draft, and corrosion, and an efficient system of controls and operating parts which makes anthracite heat entirely automatic. A full set of Minneapolis-Honeywell controls is included.

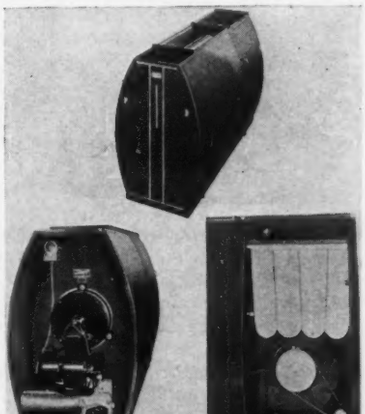
◆

235—Sunburst Flame

Gar Wood Industries, Inc., Detroit, announces the addition of a new Gar Wood Tempered-Aire unit model 101.

The new residential unit, which sells at a low price, has curved sides to conform to the shape of the teardrop firebox, with stainless steel trim.

For the new model 101, Gar Wood engineers perfected an entirely new and scientific way of mixing oil and air to produce the sunburst flame. The air for the burner, instead of being



forced directly through the jet and ignition tube assembly, enters a specially constructed air chamber which surrounds the burner tube. This air, under constant, stable pressure, is discharged across the end of the ignition and jet tube assembly rather than through and out of the tube.

Elongated, bag-type, washable, air filters, providing an extremely large filtering area, are suspended downward.

The new model is a completely coordinated oil heating and winter air conditioning unit, rating 100,000 Btu per hour at the bonnet. The firing rate is one gallon per hour. The burner uses No. 1, 2 or 3 standard commercial grade fuel oils. The steam-type humidifier is a steel tube placed within the firebox. The silent, multiple-vane blower is mounted on rubber to eliminate transmission of noise. The fan-wheel bearings on the blower are also mounted in solid rubber pillow blocks.

236—A.C. Arc Welder

General Electric Co., Schenectady, New York, has developed a new 150-ampere alternating current arc welder of the transformer type for low current welding with heavily coated alternating current arc welding electrodes. While it is chiefly intended for use on light-gage metals, its wide welding range—35 to 180 amperes—permits its use on fairly heavy materials as well.

The new equipment is built with woven, spun-glass fireproof insulation.

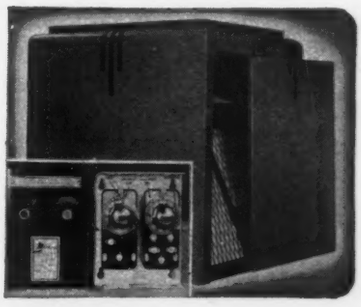
A choice of two open-circuit voltages (80 and 100 volts) is provided to handle all types of a-c electrodes.

The equipment meets the requirements of the latest standards of Underwriters' Laboratories, Inc.

◆

● 237—High-Low

Viking Air Conditioning Corp., Main and Center St., N. W., Cleveland, announces the Viking high-low automatic speed control for Viking furnace blowers, adaptable to any fur-



nace. Six fan speeds are provided, making possible continuous blower operation.

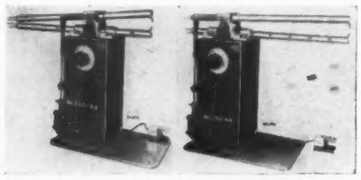
Viking blower features announced are: weather-stripped filters, a third more filter area, filters clamped tight to felt-lined frame, automatic speed control, sealed airtight bottom, self-adjusting motor base to maintain proper belt tension, adjustable 3-speed drive, rubber cushion cups to eliminate noise and vibration, felt seal between blower and cabinet, and felt-caulked casing joints to eliminate leakage.

New Products . . . . . .

For your convenience in obtaining information regarding these items, use the coupon on page 92.

238—Universal Spot Welder

The Eisler Engineering Company of 750 South 13th Street, Newark, New Jersey, has placed on the market a Universal long horn spot welder for deep sheet metal work. The novel feature of the machine is that both horns, the upper and lower, can be lengthened



or shortened to the desired type and size of work. The new feature claims that the horn adjustment makes it possible to weld light and heavy work and deep metal parts. Markings on the horn represent the KVA ratings—when the horn is placed on the 25 mark it represents 25 KVA, when the horn is readjusted to 50 it represents a 50 KVA. The spot welders are made with many different styles of welding tips, in this case, the water cooling goes through the entire arm.

The Eisler spot welders are made foot air or motor operated in 3 sizes.

◆

239—Room Thermostats

Automatic Products Company, 2450 N. 32nd St., Milwaukee, Wisconsin, announces the new A-P 88 series room thermostats, designed by Barnes & Reincke. The thermometer is recessed for protection against breakage. Cover

louvres have been eliminated and instead, air is circulated between the base and bottom of the cover.

The new thermostats offer quick cycling temperature control for either high or low voltage installation, with or without "Heat Anticipator." They can be used for heating and cooling, or heating or cooling. The new "Heat Anticipator" is said to assure unusually accurate control of temperatures within a maximum variation of less than 2 deg. F, with practically no "over-shooting."

● 240—Nite-Temp Switches

Julien P. Friez & Sons (a Division of the Bendix Aviation Corporation) of Baltimore, Maryland, announces a new synchronous, self-starting electric clock switch especially suited for day-night temperature control applications.

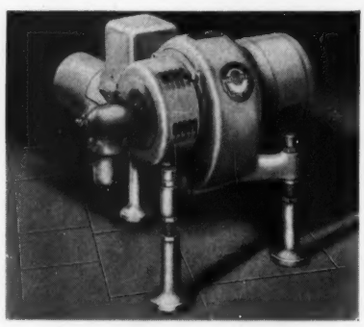
By means of this new instrument in conjunction with thermostats and effective temperature control instruments,

an automatic night-time temperature setback is provided with consequent savings and convenience to users. The Friez Nite-Temp clock switches may be located either with the thermostat or other control instrument concerned or in some other remote location.

◆

241—Conversion Burner

Hart Oil Burner Corporation, Peoria, Illinois, has just started production on their new high pressure burner —Hart Model HC—designed for low-



cost heating, and with a capacity up to and including 5 gallons per hour.

Specifications include a ⅙ hp., 1725 rpm, long hour, heavy duty motor designed for lower power consumption and long life.

242—Holgun

The Black & Decker Mfg. Co., Towson, Maryland, is introducing a new drill—the Holgun—a heavy duty production unit. The no-load speed is 1700 rpm, and the capacity in steel is ¼ inch. Weighs 2¾ lbs., overall length is 6¾ inches. Universal motor operates on a. c. or d. c. current.

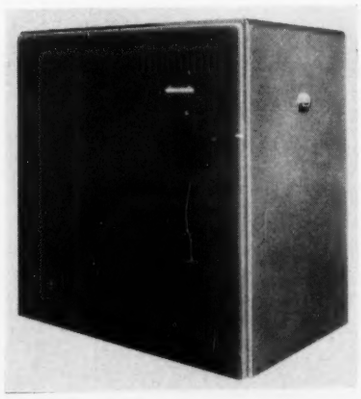
Pistol Grip and Trigger Switch adapt the tool for control with either right or left-hand operation.

The structural features and operating advantages of the new Holgun have been adapted to a versatile screwdriver for production work on wood and metal—the Scrugun.

◆

● 243—Yorkair Heat Units

S. E. Lauer, vice president and general sales manager of the York Ice Machinery Corporation, York, Pa., announces that his company is completing its line of year 'round air conditioning equipment by placing on the market four new units—an oil-fired air conditioning furnace, gas-fired air conditioning furnace, split-system air



conditioner, and a residential summer conditioner.

The Yorkaire Heat oil-fired conditioning furnace in four models meet varying home-size requirements.

The Yorkaire Heat gas-fired air conditioning furnace is available in nine models of different sizes.

The Yorkaire Heat split-system air conditioner is a floor model winter air conditioning unit designed for use with Yorkaire heat oil-burning and gas-burning boilers.

The Yorkaire Heat residential summer conditioner is made in 3 models.

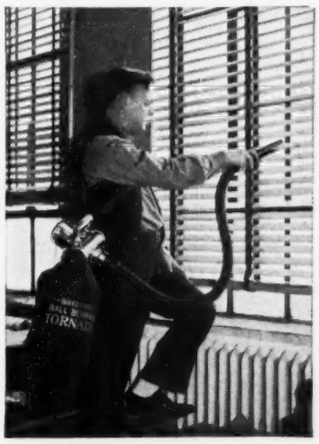
All these units are "packaged" and finished in luminescent gray.

New Products . . . . . .

For your convenience in obtaining information regarding these items, use the coupon on page 92.

244—Venetian Blind

Breuer Electric Mfg. Company, 5100 N. Ravenswood Avenue, Chicago, announces a new attachment for use with the Tornado portable electric cleaner

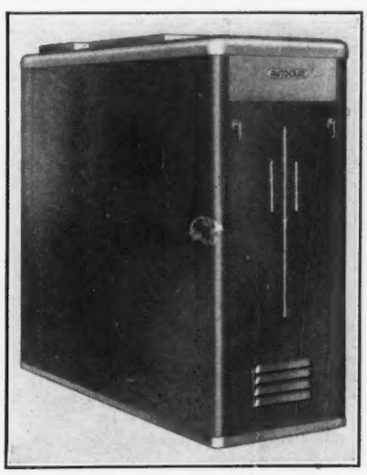


—a venetian blind cleaning attachment that cleans both sides of each slat at one time. Soft goat hair moves the dirt into the suction stream. The attachment also cleans both sides of the tapes at one operation.

◆

245—Furnace Completely Wired

Autocrat Oil Burner Corporation, Cedar Rapids, Iowa, announces the Unitaire, a new steel oil-fired winter-summer unit completely wired, including all controls and shock-proof main



switch with fuses. The new unit solves the problem of local installation and wiring.

Operation of blower for summer cooling is controlled by low voltage switch which may be mounted in living room or some other convenient location in the home. Changing from summer to winter operation is accomplished by simply throwing a small toggle switch mounted on front of control panel. Entire unit is wired with Flamenol, General Electric's new heat resisting, oil-proof wire. Wiring is in four colors for ready identification and quick hook-up. No external line voltage wiring is required other than bringing the 110-volt supply line to the main switch at the upper right of the control panel. Low voltage wiring from control panel to thermostat and summer blower switch completes the installation. The package unit includes everything necessary for complete installation of unit except duct work and tank. Combustion chamber is pre-cast, easily assembled. Adjustable hot water heater is optional.

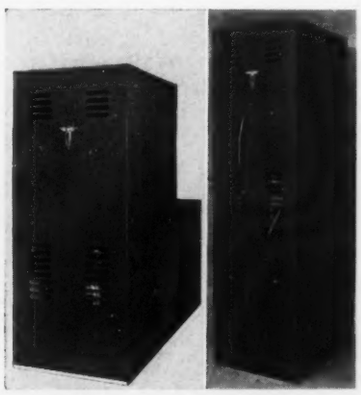
Fully enclosed in 20-gauge streamlined jacket finished in two-tone baked enamel with chrome trim, the new unit may be set up, completely wired, in about two hours, ready to operate.

The new unit is available in sizes ranging from 80,000 to 200,000 Btu register output per hour (for homes of 5 to 20 rooms).

◆

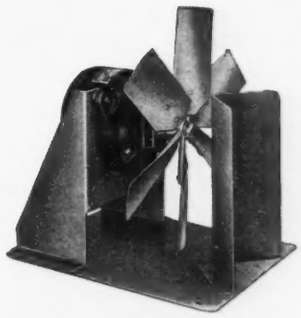
246—Janitrol Conditioners

Surface Combustion Corporation, Toledo, Ohio, has added to the Janitrol line two new winter air conditioners for low-cost housing projects and also for the replacement market. The new models are known as the BCV90-83 and the BCH90-83. Each has a capacity of 90,000 Btu input.



The BCV, or vertical model, is especially adapted for installations where floor space is at a premium, occupying a space of only 22 in. wide by 25½ in. deep. The height is 74 in. The blower on this model is mounted beneath the heat exchangers.

The BCH, or horizontal model, is only 52 in. high, making it suitable for basements of exceptionally low ceiling heights. The blower on this model is mounted back of the heat exchangers, with the total floor space being 22 in. wide by 50½ in. deep.



247—Booster Furnace Fan

Autovent Fan & Blower Company, 1805-3A N. Kostner Avenue, Chicago, has recently designed a booster, propeller-type fan for warm air gravity heating systems, for installation at the base of the cold air return duct where it contacts the furnace.

Equipped with patented deflector plates, it is designed to prevent air pockets at any point along the furnace base. Forced air action moves the heated air out of the furnace and distributes it to all rooms.

During hot summer months, it acts as a cool air booster.

◆

● 248—Furnace and Fan

International Engineering, Inc., Dayton, Ohio, is offering the Dayton furnace unit, incorporating the Dayton fan unit rated at 600 rpm giving 2541 cfm at the orifice, and using ¼ hp motor—said to be noiseless.

The fan unit is absolutely separate from the cabinet and is bolted to the floor. The motor is fitted as a stand-

ard with a variable speed pulley or three different diameter pulleys for speed regulation.

The cabinet has rounded corners, a baked maroon finish with chromium trim, made of heavy steel sheets.

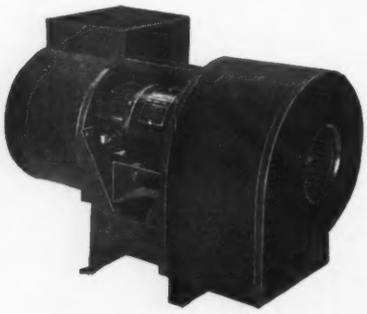
For the dealers who like to make their own cabinets and furnish their own filters and fan switch, the company offers the fan unit only with a detailed drawing showing how to make a cabinet and how to place the filters and the fan unit in the cabinet.

New Products . . . . . .

For your convenience in obtaining information regarding these items, use the coupon on page 92.

249—Type UN Blower

The Peerless Electric Company, Warren, Ohio, announces type "UN" direct-drive blowers which incorporate a flexible scroll mounting, permitting discharge in any one of four directions.

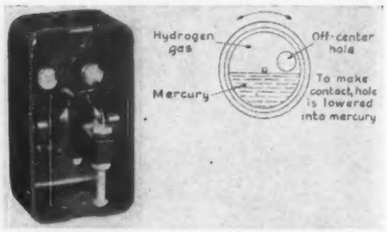


Two dynamically and statically balanced squirrel-cage type wheels are mounted directly on the shaft of a quiet-operating capacitor motor, made by Peerless especially for blower duty, and which can be supplied for one, two or three speed operation.

◆

● 250—Mercury-Button

General Electric Co., Schenectady, New York, announces a new single-pole limit switch (CR9440-E1A) which uses a mercury-button contact mechanism to open and close the circuit. The new device is particularly suitable for use where the force available



for operation of the switch is small, inasmuch as the only force required to operate this switch is that necessary to lift a light-weight molded lever or arm. The arm returns to its lower position by its own weight.

The mercury-button element consists of two corrosion-resistant-metal hemispherical shells separated by a special ceramic disk with an off-center hole. The assembly is partially filled with mercury. An atmosphere of hydrogen prevents burning and corrosion. The unit is hermetically sealed with a glass ring so that there is no question of maintenance.

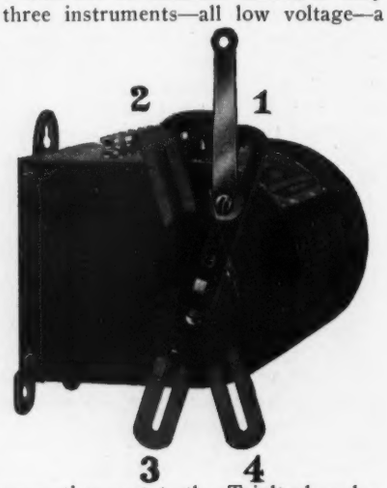
When the mercury button is rotated in the vertical plane, the off-center hole, normally below the surface of the mercury, is raised out of the mercury, thus opening the circuit between the metal shells. Because of the tendency of the mercury to cohere, and its lack of adhesion to the insulating disk, a positive, quick break is assured.

◆

251—Master Tripltrol

The White Manufacturing Co., 2362 University Avenue, St. Paul, Minnesota, announces Master Tripltrol, for hand-fired furnaces with blowers or hot water heating systems with circulators.

The set of controls embodies only three instruments—all low voltage—a

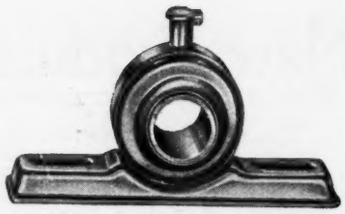


room thermostat, the Tripltrol and a damper motor with a 110-volt switch for controlling the blower or circulator.

The Tripltrol not only recognizes these three temperatures but it cooperates with the room thermostat to

so co-ordinate the action of the blower and the draft dampers as to take care of all the changing conditions that can arise either at the room thermostat or in the bonnet of the furnace.

The crux of the Tripltrol System lies in the flexibility of the Master damper motor. Operating as it does to four different positions, it takes any one of three positions when the room thermostat calls for heat, moving from one to the other according to the action of the Tripltrol, to suit the ever changing bonnet temperatures.



● 252—Lau Pillow Blocks

The Lau Blower Company, Dayton, Ohio, announces Lau self-aligning pillow block featuring light-weight, oil-tight steel housing, a large reservoir holding twice the usual amount of oil, Durex bushing which feeds oil to shaft by capillary action and maintaining constant oil film even when shaft is not rotating. The spherical surface of the bearing conforms to contour of the housing, providing a universal joint action. The bearing projects beyond the edge of the housing to provide a self-lubricating bearing seat for the collar. Long bolt slots permit interchanging with other pillow blocks.

These streamlined pillow blocks are finished in the new "Dulkrome."

A leaflet gives dimensions, and further information.

◆

253—Additional Controls

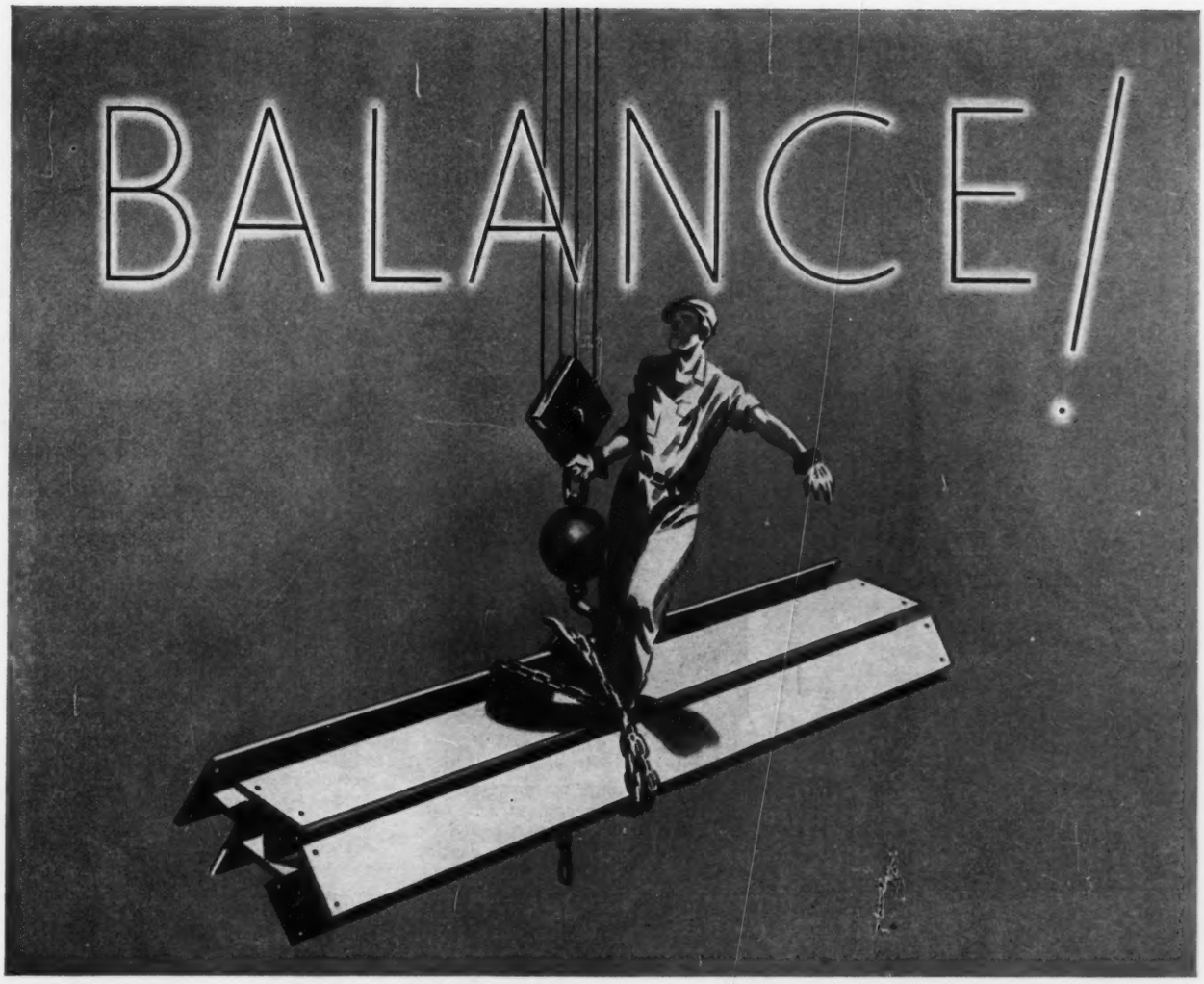
Perfex Corporation, Milwaukee, has added two controls—Series 475, a combination warm air and fan control, and Series 470, a two-speed fan control.

These controls are especially designed to control the type of motor and carry the motor loads encountered in forced warm air heating.

All adjustments and settings are "finger-tip" and easy to make. "Cut-

In" and "Cut-Out" points are plainly marked by pointers. The indicator on the external knob shows the temperature surrounding the thermal element.

All models have a "Summer Cooling Position" mark on the cover. When the external indicator knob is turned to this position the fan will operate continually providing a pleasant circulation of air for summer comfort. When the fan is to be stopped, the knob is merely released.



Proper balance marks the difference between fair sailing and hard going in work as well as play. To earn a profit in your business, for example, you must maintain a balance between cost and selling prices, between wages and overhead expense, between too large and too small a stock of materials. These are easier said than done.

Thousands of sheet metal men have found the answer to the last of these problems—a balanced inventory—in Osborn service. Here, they can get promptly all of the materials and supplies they use in their sheet metal, heating and ventilating or roofing work; all of the tools and machinery they need to keep their shop and installation costs at a minimum. Here too, they have the assurance when ordering that both they and their customers will be satisfied because every Osborn item is a leading brand or make.

Put an end to your own delay and worry of getting the right materials by letting Osborn serve you from three of the country's largest and most complete stocks. The 210 page Osborn Stock List makes it easy to keep your own stock in balance and to pick-out just the items you want for any job which may come up. Would you like a copy?

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New Products . . . . . .

For your convenience in obtaining information regarding these items, use the coupon on page 92.

254—Stack Thermometer

Julien P. Friez & Sons, Division of Bendix Aviation Corporation, 4 N. Central Ave., Baltimore, Maryland, announces a new Friez pocket stack temperature thermometer, incorporating the reversible combined "case-handle," and of especial interest to the installation or service man.

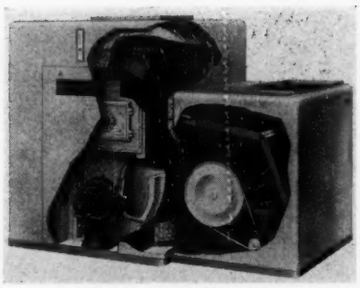
The material used in these thermometers in high-temperature glass specially annealed and treated for the purpose. The standard range on this Friez type PT/9 thermometer is from 30 to 900 deg. F. in 10 deg. divisions. The convenient size (7½ in. long) and novel "case-handle" application make this new instrument desirable. The thermometers are lens-fronted, providing precision and reading ease.

255—Model 70 Oil Unit

York Oil Burner Company, Inc., Jessop Place and P. R. R., York, Pa., announces York Model 70—a new winter air conditioning unit.

It is furnished with conventional oil-burning base and moulded-in combustion chamber. It is rear-fired by a York Model F flange mounted burner, or with gas burning equipment.

The metal cabinet is finished in green, with stainless steel trim. Rating 85,000 Btu at the register.



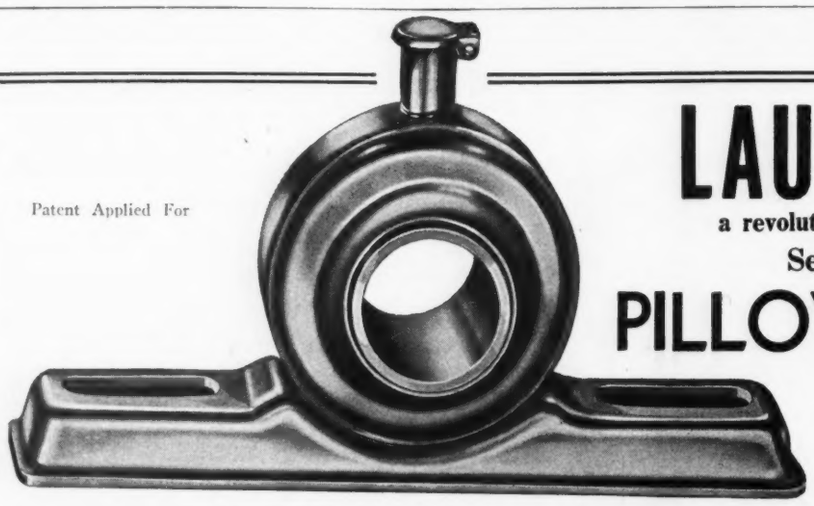
256—Oil Burning Unit

The Fox Furnace Division of American Radiator Company, Elyria, Ohio, has recently announced a new Series No. 1100 air conditioning unit designed for oil burning exclusively and equipped with pressure-type oil burner and combustion chamber.

This new Sunbeam Series has a boiler plate steel heating element. The radiator is of the kidney type and has an unusually large amount of heating surface. A baffle, welded in the radiator, holds the hot gases within the unit until the products of combustion are thoroughly utilized.

The Sunbeam oil burner with which the Series No. 1100 is equipped is a highly efficient pressure type burner.

The cabinet is constructed of No. 20 gauge steel finished in two tones of green crystalline baked enamel. Two banks of filters provide ample filter area and enable the home owner to remove the blower access door during the summer for cool, purified air.



Patent Applied For

LAU *Presents*

a revolutionary, low priced,

Self-Aligning

PILLOW BLOCK

Completely Self-Aligning at All Times, Under All Conditions

The Lau self-aligning pillow block is completely *self-aligning at all times, under all conditions.*

The spherical surface of the bearing conforms to the contour of the housing, providing a universal joint action.

The die-formed steel housing holds twice as much oil as the ordinary cast iron type bearing reservoir. Oil is fed to the surface of the Durex bearing by capillary action. A constant oil film is maintained at all times, even when the shaft is not rotating.

Slotted bolt holes permit interchanging with other pillow blocks. Bearing projects beyond edge of housing, providing a self-lubricating bearing seat for the collar. A new idea in rubber mountings (optional).

WRITE NOW FOR COMPLETE DATA AND PRICES.

Manufacturers of blowers from 4½-in. to 25-in. diameter . . . almost any width.

The Lau Blower Company

Monument Avenue, East **DAYTON, OHIO**

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The "Pipe of Peace"— and Comfort!

Because—

It is "Built to Outlast the Buildings It Goes Into".

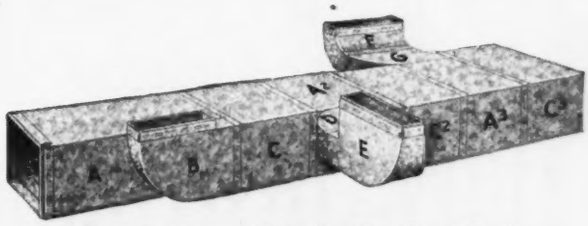
It is correctly designed to speed the flow of air with a minimum of friction.

Its construction promotes FAST installations, planned profits and perfect performance—all of which add up to

PEACE and COMFORT

You'll probably never build a wall stack like this—but it can easily be done with

HANDY PIPE!



Handy Duct Work Really Fits!

The above "assembly" includes straight sections A, A-2 and A-3; B is our new G-290 elbow; C, C-2 and C-3 are two-way splitters; D and E are G-23 reverse elbows; F is G-16 elbow and G is a G-24 reverse elbow.

If you haven't our Handy Pipe Catalogue No. 51 and our Duct Work Supplement, your information isn't up-to-date. ASK FOR THEM.

Are You Getting YOUR Share of the Business the Government's Lending-Spending Program Is Creating. It's There!

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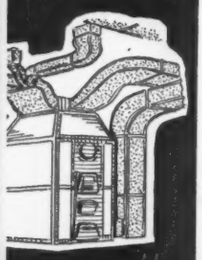
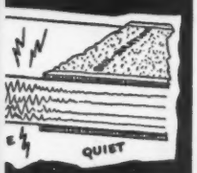


LUTE FLEXIBILITY

LABOR SAVING



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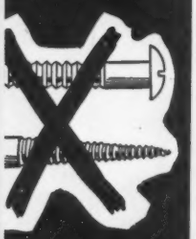


REWS, LUGS, BOLTS OR WIRE

ACKAGE - - NOTHING ELSE TO BUY

CUT DOWN YOUR "CALLBACKS" and CUSTOMER COMPLAINTS!

Insulate Every

LONG-RUN... GARAGE RUN.. ATTIC RUN...

and Every Run thru

UNEXCAVATED PARTS... *with Asbestos Protected*

DUX-SULATION

- **STOPS HEAT LOSS AND CONDENSATION**
- **ABSORBS NOISES**
- **EASY TO APPLY**
- **LOOKS GOOD**
- **WILL NOT CHIP OR CRACK**
- **INEXPENSIVE**

Write or Wire for Bulletin No. 387

GRANT WILSON CO., INC.
West Taylor Street — Chicago, Illinois

ANT RUBBER & ASBESTOS WORKS
Brannan Street — San Francisco, Cal.

R CONDITIONING UTILITIES CO.
st 40th Street — New York, N. Y.

Association Activities . .

Sheet Metal Distributors

The National Association of Sheet Metal Distributors, auxiliary of the National Wholesale Hardware Association, held their 44th annual convention at the Marlborough-Blenheim Hotel, Atlantic City, N. J. on October 17, 18, 19 and 20, with President A. W. Howe of the J. M. & L. A. Osborn Co. presiding.

The Hon. A. O. Eberhart, special assistant Administrator, Federal Housing Administration, Washington, D. C., spoke on the "Possibilities of the National Housing Movement for Business." This talk was especially interesting and helpful to sheet metal contractors.

O. F. Murphy, Chairman, (Lyon, Conklin & Co., Inc,. Baltimore) read the report of the Tin and Terne Plate Committee, followed by discussion.

E. H. Hoffeld, Chairman (The Ferdinand Dieckmann Co., Cincinnati) read the report of the Eaves Trough and Conductor Pipe Committee, which was followed by a discussion.

Norman W. Foy, General Manager of Sales, Republic Steel Corporation, Cleveland, spoke on "Some Present Day Problems."

A. J. Becker, Chairman (Ohio Valley Hardware & Roofing Co., Evansville, Ind.) reported for the Galvanized and Black Sheet and Corrugated Roofing Committee, followed by discussion.

Joseph Stelwagon, chairman (Stelwagon Manufacturing Co., Philadelphia) reported for the Prepared Roofing Committee, followed by a discussion of the situation.

Members handling steel sheets exclusively were invited to attend all sessions of the National Wholesale Hardware Association, and the Joint Session with the Manufacturers on Wednesday morning to listen to the address by Miles E. Robertson, Oneida, Ltd., on "Our Experience in Executing Resale Price Agreements Under the Miller-Tydings Act and State Fair Trade Laws."

A further report of this convention will appear as soon as the convention releases are available.

Coming Conventions

1938

Dec. 12-14—National Warm Air Heating and Air Conditioning Association. Annual and 25th Anniversary. Netherland-Plaza Hotel, Cincinnati, Ohio. Allen W. Williams, Man. Dir.

1939

Feb. 3-4—Sheet Metal, Warm Air Heating and Roofing Contractors' Association of Indiana, Inc., Annual Convention and Educational Program. Purdue University, Lafayette, Indiana. Paul R. Jordan, Executive Secretary, 631 S. Delaware, Indianapolis.

Feb. 6-8—Master Sheet Metal, Heating, Ventilating and Air Conditioning Contractors Association, Inc., of Wisconsin. Annual. Plankington Hotel, Milwaukee. Paul Biersach, Secretary.

Milwaukee

The October 3 meeting of the Master Sheet Metal, Heating, Ventilating and Air Conditioning Contractors Association, Inc., of Milwaukee was a dinner meeting attended by 52 active and associate members with attorney Gerald Rice, speaker of the evening, as guest.

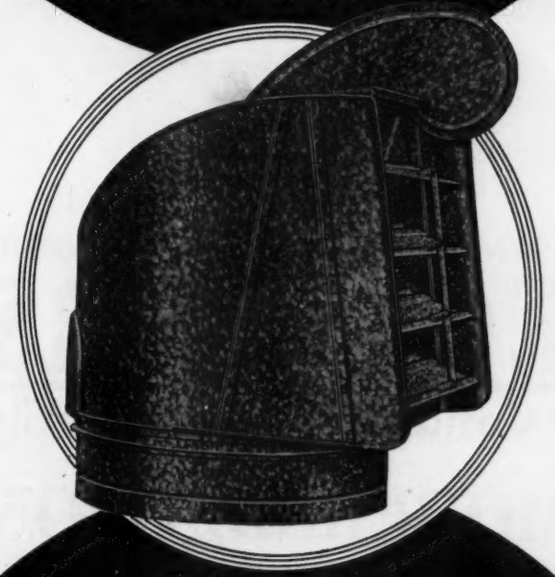
Attorney Gerald Rice gave a wonderful exposition on Licensing and Codes in an unbiased manner, citing court cases in respect thereto and illuminating these citations with his own personal and legal opinions.

The matter of creating a new sheet metal contractor list in collaboration with the jobbers was fully discussed. The matter was placed in the hands of a committee who will report at some future meeting.

Paul Biersach, Secretary.

When Ventilation Conditions are *Tough*— Requirements *Exacting*— and Customers *Particular*—

Here's the answer for both the customer and YOU!



The NEW Swartwout ROTARY *BALL BEARING* VENTILATOR

● Newly improved design and construction — greater capacity — more dependable than ever — pleasing, modern appearance — backed by a 27 year record of outstanding successful performance.

Attractive discount to Sheet Metal Contractors — write for prices and full information.

THE SWARTWOUT COMPANY
18615 EUCLID AVENUE, CLEVELAND, OHIO

Tell Them This Story Now

Tell your customers the story of the Cook Heat Control. Its economy. Comfort. Convenience. Safety. Quiet, dependable operation.

Tell them and you'll sell them. For the Cook Heat Control will give your customers exactly what they want—all the advantages of automatically controlled heat.

You can be sure of the dependable, service-free, economical performance of Cook Heat Controls. So, this season sell a Cook No. 12 Heat Control on all jobs. It's the profitable thing to do. Ask us to give you details.

COOK THERMOSTAT

COOK CONTROLS
THERMOSTATS—FURNACE LIMIT CONTROLS
ZONE CONTROLS—BLOWER CONTROLS
COOK ELECTRIC CO.

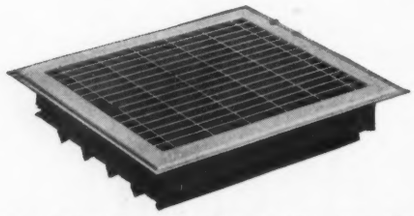
2671 Southport Avenue Chicago

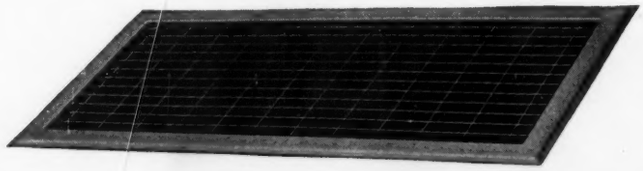
For Extra Strength and Air Flow—

DuraBilt Registers and Intakes

Carefully designed and staunchly built, Auer DuraBilt Floor Registers and Cold Air Faces provide great structural strength and rigidity. They are assembled from steel cross-bars, each cross-joint locked and mortised, each end-joint interlocked to substantial welded and reinforced frame. High percentage of free air opening in either standard mesh or narrow mesh design. In Auer DuraBilt models you get superior craftmanship in every detail—their appearance is in good taste in any surroundings. Your supply house will gladly show them.

Send for complete Auer Register Book 38, illustrating these and many other Registers, Intakes, and Grilles for both gravity and air conditioning.





THE AUER REGISTER COMPANY, 3608 PAYNE AVENUE, CLEVELAND, OHIO

AUER DISTINCTIVE REGISTERS & GRILLES For Air Conditioning *and* Gravity

SELL COMPLETE MODERNIZATION

with RYBOLT *Air Conditioning Units*

At right. The Series 157 Winter Air Conditioning Unit.

At left. The Series 600A7 Winter Air Conditioning Unit.

The present trend to decorated basements can be a real money-maker for *you!* Nobody can feel that they've completely modernized their home if they still have an old, inefficient furnace in the basement. It's a spot for you to step in and show them how a RYBOLT Air Conditioning Unit encased in a smart streamlined jacket will enhance the appearance of the basement a hundredfold, in addition to giving them clean and trouble-free heat. And when you tell them of the other superior features, such as quick response to firing, ease of cleaning, and duplex ball-bearing grates . . . you'll clinch the job in nothing flat. Sell the homeowner on *complete* modernization and you'll open up a gold mine of profits. Write today for further information.

THE RYBOLT HEATER COMPANY
ASHLAND, OHIO

—News Briefs—

New Incorporations

The Broen Sheet Metal Products, Inc., 14035 12th street, Detroit, Mich., has been incorporated with a capital stock of $5,000, of which $4,000 has been paid in.

◆

The W. L. Walter Co. has engaged in the wholesale air conditioning equipment business at 1046 S. Olive street, Los Angeles, Cal.

◆

The Ray F. Becker Co. has engaged in the sheet metal and roofing business at 685 N. Page, under management of Ray F. Becker, in Portland, Ore.

◆

F. O. Wahlstrom, general manager of operations for Southern States Iron Roofing Co., of Savannah, Ga., will locate a plant in Hattiesburg, Miss., for the manufacture of galvanized sheet roofing, shingles, drums, turpentine cups, etc.

◆

William Perry is engaging in the air conditioning and heating business at 5234 Foothill Blvd., in Oakland, Cal.

◆

The United Sheet Metal Works has been established at 1013 S. W. 1st Avenue, Portland, Ore., by Tom Accetura and Dominic Clarizio.

◆

The M. O. Cox Sheet Metal Co. has been established at 1611 S. E. 9th Street, Portland, Ore., by M. O. Cox and F. W. Deeds.

◆

The Spencer Air Conditioning Co., Inc., has been chartered in Minneapolis, Minn., with a capital stock of $25,000, by J. B. Spencer, 2215 Newton S.; R. Herbaeck and Otto E. Kurth.

◆

Heating Engineers, Inc., has been chartered in Minneapolis, Minn., to handle oil burners, oil burner heating units, heat control equipment, and other devices, by William F. Hoppe, 80 S. 9th St., C. M. Stroud, 2849 44th Ave. S. and Armin M. Johnson, 1260 Northwestern Bank Bldg., all of Minneapolis.

◆

The Norge Heating & Appliance Co. has been chartered in Milwaukee, Wis., to engage in heating and air conditioning business, by W. J. McCormick, 312 E. Wisconsin Ave., Robert G. and Dela Hunt.

◆

The International Air Conditioning & Appliance Co. has been incorporated in Houston, Tex., by O. C. Behse, 7600 Washington St., and A. C. Bering, Jr.

◆

O'Maley-Lineberry, Inc., has been chartered to engage in the air conditioning business by George T. O'Maley, Jr., and Thomas R. Lawler, Kansas City, Mo.

◆

Carl F. Franz, formerly president of Ettel & Franz, St. Paul, Minn., has engaged in the sheet metal, roofing and ventilating business at 602 North Fairway avenue, St. Paul.

◆

The Acme Sheet Metal Co. has been incorporated in Kansas City, Mo., with a capital of $15,000, by Harold Martin, and Alexander T. Sharp, 950 Dierks Bldg.

◆

The Great National Air Conditioning Corporation has been chartered in Dallas, Tex., by F. E. Bokern, 5627 Monticello street, and others to be located at 911 Horton street at Terminal, in Dallas, Tex.

◆

The Hughes Sheet Metal Works has been established at 2651 Main street, Santa Monica, Cal., by L. Hughes, Albert O. Calhoun and Johnson Hughes.

◆

Clarence Groff, of Remsen, Ia., has established a tin, heating and plumbing shop in Pocahontas, Ia.

◆

The Central Iron & Metal Co. has been chartered in Milwaukee, Wis., by Sam and Maurice Kimmel and Mary L. Cabbe.

DYNAMICALLY BALANCED

Utility Fan Corporation's
ALL YEAR CONDITIONER

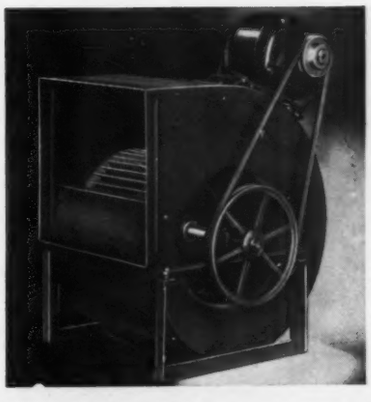
A complete furnace blower to convert gravity hot air furnaces into forced draft heating plants.

Installed by cutting top panel—no special duct fittings . . . "Dust-Stop" filters . . . Full floating blower . . . Variable speed pulley . . . minimum floor space required . . . full range of sizes.

Dealers' price
Model 110 DF
F.O.B. Los Angeles
$39.50

BLOWERS

Full floating . . . statically and dynamically balanced . . . self-aligning bearings rubber cushion mountings . . . . . . completely die formed . . . baked enamel finish . . . maximum efficiency . . . lower power consumption . . . longer life.



UTILITY

Write Today For Complete Catalogs

UTILITY FAN CORPORATION
2528 Santa Fe Ave., Los Angeles, Calif.
Please send complete information on you
All Year Conditioner
Blowers Evaporative Coole
Name
Street
City State

U.S. AIRCO

announces

NEW LOW PRICES

for DEALERS, JOBBERS
and MANUFACTURERS

Example:—

USAIRCO 12" Blower-Filter Package Unit—complete with Minneapolis-Honeywell Furnacestat (capacity 1600-1800 CFM) ready to install. DEALER'S Price, F. O. B. Factory

$54.50

Four other sizes, smaller and larger (including Furnacestat) capacities from 1000 CFM to 5500 CFM, at similar low prices, from

$40.50

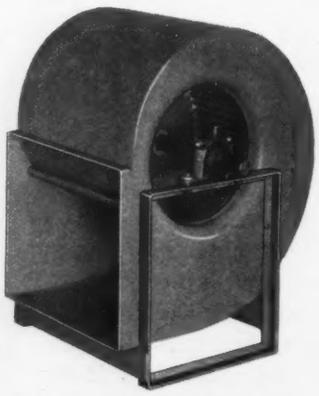
U. S. AIRCO Blower-Filter Package Unit

Compact, neat looking, quiet. Dependable, economical operation. Easy access to all parts. G. E. Guaranteed Motor. Graphite Bronze Sleeve Bearings. Automatic Belt Tightening and other quality features.

Another Example:—

USAIRCO 10½" Blower Assembly (less drive and motor) capacity 1000 to 1200 CFM. DEALER'S Price, F. O. B. Factory

$18.00



Any size blower from 800 CFM up. Also separate wheels and scroll housings, if desired.

U. S. AIRCO Blower Assembly

Design and construction assure quiet, efficient, vibrationless operation. Easily adapted to any warm air furnace installation.

Liberal discounts to Jobbers and Manufacturers on complete line of Blower-Filter Units and Assemblies. Before your 1939 commitments are made, get complete details on U. S. AIRCO equipment.

Orders Shipped Immediately

Write for complete catalog, prices and discounts.

U. S. AIR CONDITIONING CORPORATION
2105 Kennedy St. N. E., Minneapolis, Minn.

News Items . . . . . .

Domestic Air Conditioning Co. will install a gas automatic heating and air conditioning system in the 1939 Ideal Home being constructed in connection with the Detroit Builders' Show. The firm was selected by means of an impartial drawing in which eligible firms in the Detroit metropolitan area participated.

At the meeting for the drawing were: F. E. Ritzenheim, president of the Air Conditioning Institute and Domestic Air Conditioning Co.; Robert F. Haggerty, Ideal Furnace Co.; H. B. White, sales manager, and W. Weir, district sales manager, Gasconaire, Inc.; J. M. Fisher, vice president, and R. R. Houser, local manager, Bryant Air Conditioning Corp.; B. J. Tremayne, Boyd-Cooper Heating Co.; L. A. Watson, sales manager of the Detroit branch, Kelvinator Corp.; Abner Baker, sales engineer, Surface Combustion Corp.; J. H. Numberg, Detroit air conditioning branch manager, and Gilbert Radoye, publicity director, Gar Wood Industries, Inc.

Obituary

Michael B. O'Connor, 69, for 40 years a member of the Detroit heat engineering firm of O'Connor Brothers, died September 24 after an illness of more than a year. Retired from business for the past 10 years, he is survived by his widow, a son, two daughters, a brother and two sisters.

◆

The death is reported of Frank J. Merz, who was engaged in sheet metal work business at Seattle, Wash.

◆

M. Reuter, of the sheet metal firm of M. Reuter & Sons, Portland, Ore., is reported deceased.

Statement of the Ownership, Management, Circulation, etc., Required by the Acts of Congress of August 24, 1912, and March 3, 1933

Of American Artisan, published monthly at Chicago, Ill., for October 1, 1938.

State of Illinois, County of Cook, ss.: Before me, a Notary Public in and for the State and county aforesaid, personally appeared F. P. Keeney, who, having been duly sworn according to law, deposes and says that he is the business manager of the American Artisan, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, Keeney Publishing Company, Chicago, Illinois.
Editor, J. D. Wilder, Chicago, Illinois.
Managing Editor, J. D. Wilder, Chicago, Illinois.
Business Manager, F. P. Keeney, Chicago, Illinois.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorported concern, its name and address, as well as those of each individual member, must be given.)
Keeney Publishing Company, 6 N. Michigan Avenue, Chicago, Illinois. Stockholders: F. P. Keeney, Chicago, Illinois; W. J. Osborn, Fairfield, Conn.; R. Payne Wettstein, Chicago, Illinois; Chas. E. Price, Chicago, Illinois; Robert A. Jack, Cleveland Heights, Ohio.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is .....
(This information is required from daily publications only.)

F. P. Keeney,
Business Manager.

Sworn to and subscribed before me this 30th day of September, 1938.
(SEAL) Grace E. Waymire, Notary Public.
(My commission expires February 10, 1942.)

FAN BLADES

Certified Ratings

IMPORTANT FEATURES

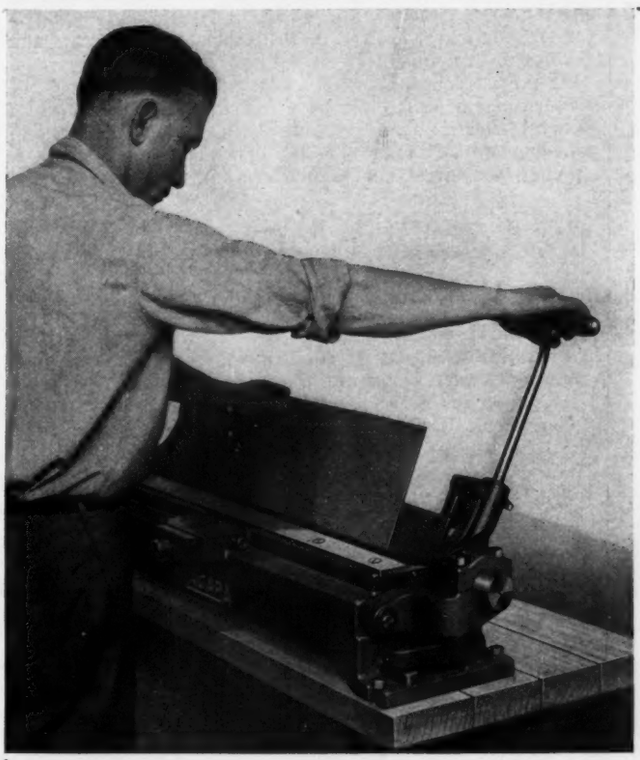
- Guaranteed certified ratings
- Die stamped and formed steel blades
- Perfect balance and alignment
- Greater volume of air per watts consumption
- All sizes 19″ to 60″

Types

Attic—slow speed
Exhaust—belt drive
Exhaust—direct drive
Pedestal—direct drive

WM. J. LOHMAN, Inc., 62 Ninth Ave., New York, N. Y.

Write today for further information, a postcard is sufficient.

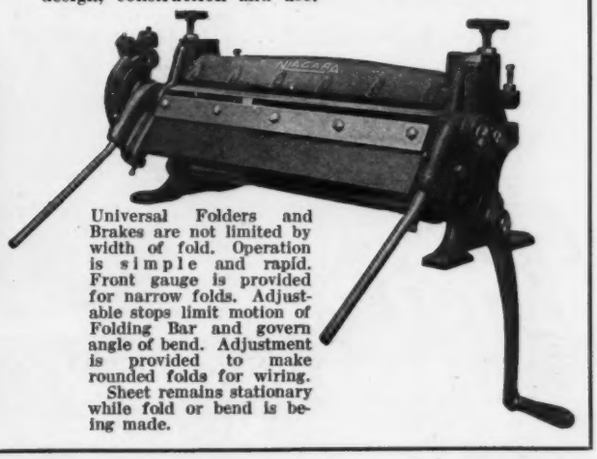


How Sheet Metal Men Save Time and Sweat with Niagara Folders and Brakes

Easy, rapid and accurate work and universal adaptability for making a wide range of products requiring bending and folding to an angle or lock make these machines among the most important in your sheet metal shop.

Niagara machines are built to please the men who use them. Convenient, easy operation save time and effort, and turn out the kind of work that you can be proud of.

Don't struggle along with old equipment,—write for Bulletin 74 giving complete information on their design, construction and use.



Universal Folders and Brakes are not limited by width of fold. Operation is simple and rapid. Front gauge is provided for narrow folds. Adjustable stops limit motion of Folding Bar and govern angle of bend. Adjustment is provided to make rounded folds for wiring. Sheet remains stationary while fold or bend is being made.

NIAGARA MACHINE & TOOL WORKS

637-97 Northland Ave. Buffalo, N. Y.

PLAN on INCREASED SALES and PROVEN PROFITS with *Pacific*...

THE GAS HEATING APPLIANCE COMPANY BACKED BY THE EXPERIENCE AND REPUTATION OF A QUARTER CENTURY

☆ This Year Gas Heating Equipment Sales Will Reach New Heights and Pacific is Again in the Lead with New Models and the only Complete Line of Heating Units in the West.

☆ Make More Sales with Pacific's Sales-Compelling Features and Reputation for Performance...

☆ Make Bigger Profits with Pacific's Liberal Dealer Plan...

☆ Join Up with Pacific and Get Your Share of This Year's Business...

Architects Specify...
Owners Demand... *Pacific*

☆ *DON'T DELAY WRITE TODAY!*

Pacific
GAS RADIATOR COMPANY
1740 W. WASHINGTON BLVD. • LOS ANGELES

With the Manufacturers . . .

Symposium on Air Conditioning

A Symposium on Air Conditioning is to be held on November 22, 1938, in the Auditorium of the Engineering Building, sponsored by the Chicago Chapter of the American Institute of Architects, the Illinois Society of Architects, the Western Society of Engineers, the Illinois Chapter of the American Society of Heating & Ventilating Engineers, the Chicago Association of Consulting Engineers, the Refrigerating Machinery Association and the Air Conditioning Manufacturers Association.

The subject of the entire meeting is "Air Conditioning for Human Occupancy." John Howatt, past president of the American Society of Heating & Ventilating Engineers and chief engineer of the Chicago Board of Education, will be the presiding officer. Speakers are: Prof. Philip Drinker, Harvard University; W. H. Carrier, Carrier Corporation; Albert Buenger, Delco-Frigidaire; Chas. S. Leopold, Philadelphia; Elliott Harrington, General Electric; John R. Hertzler, York Ice Machinery Corporation; and Wm. B. Henderson of Air Conditioning & Manufacturers Association.

◆

General Electric's Sixtieth Birthday

General Electric's 60th year was fittingly observed October 17 in Schenectady when the Chamber of Commerce presented the company with a bronze plaque, commemorating the steps leading to the formation of the company and its location in Schenectady. The plaque was presented by Laurence G. Magner, president of the Chamber of Commerce. It was accepted by Gerard Swope, president.

At a dinner given by the Chamber of Commerce, three veteran employees of the company with 50 or more years of active service were presented engrossed certificates and diamond-studded pins by the Company. The veteran employees were Charles J. Leephart of Schenectady with 55 years, Roderick S. McNeil of Bridgeport with 51 years and George S. Jameson of Lynn with 50 years.

At the afternoon ceremony, Mr. Swope in accepting the plaque said in part: "We have had many great leaders of General Electric—Edison, Coffin, Rice, Steinmetz, Thomson—but this company doesn't depend on its leaders—it depends on the men and women who form this organization.

◆

Armco Industrial Festival

A great industrial festival was held in Ashland, Kentucky, on October 19 in honor of John B. Tytus and the world's first continuous rolling mill, which he and his American Rolling Mill associates helped develop there 15 years ago. Mr. Tytus was the inventor of the continuous process for rolling iron and steel sheets.

George M. Verity, founder and board chairman of Armco; John H. Van Deventer, editor of Iron Age; Charles R. Hook, Armco president; Governor A. B. Chandler of Kentucky; and C. S. Lake, assistant to the president of the Chesapeake & Ohio Railroad, talked in the afternoon.

◆

Frazee Joins Dowagiac Steel

R. S. McNaney announces the appointment of A. F. Frazee as merchandising manager of the Dowagiac Steel Furnace Company, Dowagiac, Michigan.

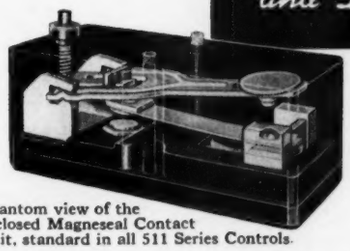
In making this announcement Mr. McNaney said, "We are and shall remain a mail order institution, with resulting savings to those dealers who are content to order by mail what they require."

Mr. Frazee comes to his new position with a wide background of experience in the industry. In 1920 he joined the Rudy Furnace Company as advertising manager, becoming general manager from 1933 to 1936. Since that time he has been in the sales and education departments of Airtemp, Inc., of Dayton, Ohio.

511 SERIES

PENN FURNACE CONTROLS

New Accuracy and Dependability



Phantom view of the enclosed Magneseal Contact Unit, standard in all 511 Series Controls.

FAN CONTROLS
LIMIT CONTROLS
COMBINATION CONTROLS

This series includes a complete line of up-to-the-minute controls for all furnace applications, each incorporating the famous completely-enclosed Penn Magneseal contact unit, which has given such outstanding performance in other Penn heating and refrigeration controls.

The Magneseal contact unit entirely eliminates pig-tails or flexible leads. Permits instant replacement of contacts in the event of damage due to abnormal load conditions. Positive snap action on both make and break. Completely enclosed heavy-duty contacts—rated for ¾ hp. A. C. service to 250 V.

Convenient range adjustment on standard controls—both cut-in and cut-out points on De Luxe Controls independently adjustable. May be mounted in any convenient position with conduit connection generally downward. Exclusive Penn ball and socket mounting flange, permits rotation of helix to most desirable bonnet position in relation to uniform temperature and free air flow. Metal guard protects helix against accidental damage in handling and installing.

Write for Bulletin WAL-1

PENN ELECTRIC SWITCH CO.
GOSHEN, INDIANA

In Canada, Powerlite Devices, Ltd., Penn Electric Switch Division, Toronto, Ontario. Branches, Factory Representatives and Distributors in all principal cities.

You can depend on
PENN BUILT CONTROLS

THE DISTINCT NEW

REX AIR-PAK

BLOWER FILTER UNIT

Automatically

OPERATES THE FURNACE AND THE BLOWER

Now!

. . . you can sell complete, automatic winter air conditioning near the price of the *Conventional single speed furnace blower!*

Now!

. . . you can eliminate expensive control systems, making winter air conditioning much easier to sell!

Now!

. . . you can maintain uniform room temperature constantly. No "cold blasts" or "off periods".

THIS COUPON WILL BRING THE ENTIRE STORY!

AIR CONTROLS, INC.
Div. of THE CLEVELAND HEATER CO.
1933 West 114th, Cleveland, Ohio

Name .....

Address .....

City..... State.....

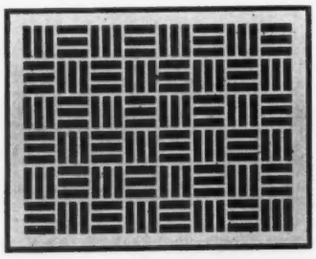
AA-11-38

PERFORATED METALS

Architectural Grilles

Grilles of distinction for fine buildings in a wide variety of designs, including standard and many original patterns. Write for information!

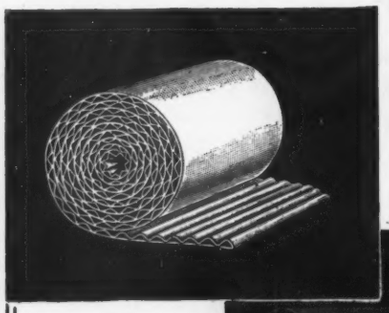
Our product includes perforated metal for all industrial and ornamental uses in all kinds of metal.



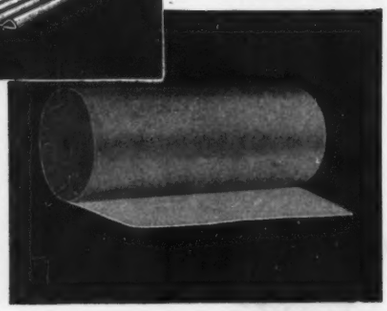
The Harrington & King PERFORATING CO.

5649 Fillmore St., Chicago, Ill. New York Office, 114 Liberty St.

SAL-MO Asbestos Insulation Curbs HEAT LOSS in Warm Air Furnace Installations . . . Assures More Efficient Operation.



(Left) SAL-MO Asbestos Aircell Paper



SAL-MO Asbestos Paper and Rollboard

BE sure that your Warm Air Furnace installations do not have that 30% heat loss that is usual with uninsulated pipes. When you use SAL-MO Asbestos Papers and Millboards you are sure of a perfect job and perfect insulation. SAL-MO Asbestos Products are of uniform high quality, manufactured from the best grade of Canadian asbestos fibre.

Other SAL-MO Products include Pipe Joint Tape, Furnace Cement, Fireboard and coverings for all types of High and Low Pressure Pipe Lines.

SALL MOUNTAIN COMPANY

176 West Adams St. CHICAGO, ILL.

With the Manufacturers . . .

New District Manager

C. P. Culbert, vice president and general sales manager, The Nu-Way Corporation, Rock Island, Illinois, announces the appointment of Joseph W. Manny as district manager in the Chicago area and of Clark S. Jarrett as district manager in the Philadelphia area.

◆

Meriam of Lincoln Electric Retires

Announcement has been received of the retirement of J. W. Meriam, for the past 24 years, vice president and secretary of the Lincoln Electric Company, Cleveland, Ohio.

Mr. Meriam's retirement, at the age of 60, closes a business career which spans the growth and development of the arc welding industry. Although retiring from active service Mr. Meriam will remain a director.

The company's credits and collections will be handled by Frank K. Griesinger.

A. F. Davis, vice president, was elected secretary.

◆

Stokol Campaign Makes Jobs

The Schwitzer-Cummins Co., Indianapolis, makers of Stokol and Triplex stokers, Stokol-Heat, blower-filter units and home ventilators, has announced the results of the 20th Anniversary Birthday Sell-Ebration in which dealers participated the first two weeks of August.

This effort resulted in 67,430 work hours, which is equivalent to 8,430 man days of labor, or in other words, year-round jobs for 30 additional men.

Special awards were given to distributors and dealers who participated. A nationwide poster showing is appearing in dealer territories on approximately 2,000 billboards. Factory production has been steadily increased and work in the shop has been provided for more than 200 additional men in the past thirty days.

◆

Minneapolis-Honeywell Launches Campaign

Minneapolis-Honeywell Regulator Company is launching a fall consumer campaign, starting with a full page advertisement in The Saturday Evening Post and Time Magazine, which is devoted entirely to the improvements in automatic heating equipment on behalf of the dealer.

The advertisement features a telegram addressed to "Mr. & Mrs. Home Owner, Everywhere" under the heading "Recent Improvements Have Revolutionized Automatic Heating." The telegram is signed by "Your Heating Dealer."

This advertisement will be followed by a series, running throughout the fall, of large space advertisements on this subject and its relation to automatic control. A large window or wall display piece will be furnished with a complete story of the campaign.

◆

Anthracite Advertising Campaign

Anthracite Industries, Inc., 3207 Chrysler Building, New York City, has prepared the Anthracite advertising campaign for fall and winter, with newspapers as the primary advertising medium, according to Frank W. Earnest, Jr., President.

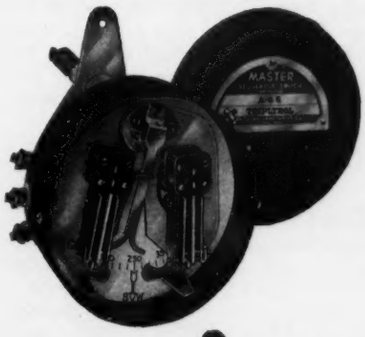
The theme of the campaign is based upon the fact that Anthracite, alone of all available domestic heating fuels, provides all 7 essentials for heating satisfaction. Anthracite is featured as the 7-star fuel. It is presented, in the advertising, as a fuel that parallels the qualities of champions in the field of sports. As no champion was ever selected for excellence in one or a few good points, so the champion fuel must excel in all 7 points of heating satisfaction—comfort, convenience, safety, cleanliness, healthfulness, dependability and economy.

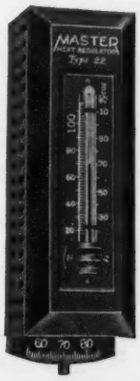
The campaign was prepared and is being released by The Simpers Company, Inc., of New York.

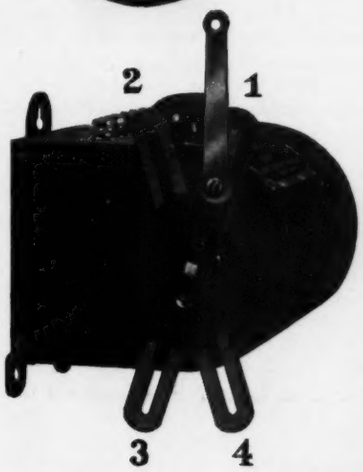
the Master Tripltrol

a new development in controls for hand fired furnaces with circulating blowers

Built especially for hand-fired furnaces with blowers this control is also applicable to hot water heating systems with circulators. The Tripltrol System recognizes the need of functioning from three definite temperatures encountered in the bonnet of a furnace. Through cooperation between room thermostat and bonnet control it coordinates the action of the circulating blower and draft dampers to perfectly meet every condition.







The main feature of this system lies in the flexibility of the Master damper motor which will take any one of three positions when the room thermostat calls for heat. In one position the draft only is on, in another the draft and fan, and in the third the fan only.

BOTH SUMMER AND WINTER CONTROL

For full information write for Bulletin 900

WHITE MANUFACTURING CO.

2362 UNIVERSITY AVE. ST. PAUL, MINN.

MASTER HEAT REGULATOR

A special job in the Booth Shop. Fabricating a "headache post" for a truck.

"OUR BUSINESS IS UP 100%," SAYS THIS LINCOLN USER

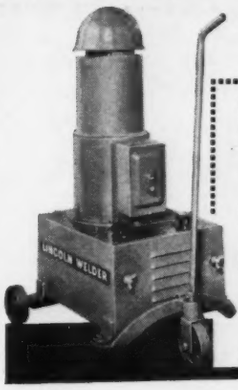
● Since installing the Lincoln "Junior" Arc Welder, J. T. Booth Co., Beaumont, Texas, reports double the amount of business formerly obtained without arc welding. Mr. Booth says that their Lincoln Welder has brought them a large volume of fabrication work in metals 16-gauge and heavier which they did not get formerly. This work includes black iron, galvanized iron and stainless steel. They have also started to manufacture a line of all-welded attic ventilators which are selling like hot cakes.

The experience of this progressive sheet metal shop coincides with that of Lincoln users everywhere. Equipped with this DC motor generator type welder, they can fabricate all metals and alloys in less than half the usual time and at a saving in cost which usually pays for the Lincoln Welder in a few months' time.

The Lincoln "Junior," preferred by most sheet metal shops, is available in ratings of 75, 100 and 150 amps, portable or stationary. Priced at less than $200 complete with accessories. For complete details consult the nearest Lincoln office or mail the coupon.

THE LINCOLN ELECTRIC COMPANY

Largest Manufacturers of Arc Welding Equipment in the World



THE LINCOLN ELECTRIC CO.
Dept. EE-551, Cleveland, Ohio

Send free copy of Bul. 314 and payment details on the Lincoln Sheet Metal Shop Welder.

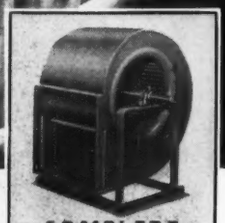
Name _____ Position _____

Company _____

Address _____

City _____ State _____

"HAVE CLARAGE MAKE THEM"

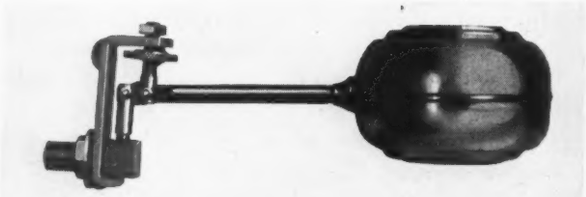


Every year we ship to furnace manufacturers and to builders of unit air conditioners thousands upon thousands of Clarage Blower Wheels and Assemblies. These smaller units were designed with the same skill characteristic of the larger Clarage equipment — just as carefully constructed — just as carefully tested. And we have sizes to meet ALL REQUIREMENTS — with slow speed operation insuring SILENT PERFORMANCE. May we have your next inquiry?

SPECIFY CLARAGE for COMPLETE AIR CONDITIONING • VENTILATION • HEATING • COOLING • MECHANICAL DRAFT • FANS & BLOWERS FOR INDUSTRIAL NEEDS

CLARAGE FAN COMPANY • Kalamazoo, Mich.
SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

SOMETHING TO TALK ABOUT



The famous Skuttle valve is certainly something to talk about, because it is the reason Skuttle humidifiers give faultless performance and years of dependable service. The Skuttle valve is opened and closed by the direct lever action of the arm supporting the float which rests on the water in the evaporator pan, and rises and falls as the water level changes. A live rubber disc pressed tightly over the water inlet assures tight closing of the valve even after years of use.

Skuttle
AUTOMATIC HUMIDIFIERS

J. L. SKUTTLE CO., 999 FRANKLIN ST., DETROIT, MICH.

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 92.

317—Catalog 38A

Auer Register Company, 3608 Payne Avenue, Cleveland, has issued Catalog No. 38A, illustrating and describing the complete Auer line of registers and intakes for air conditioning purposes.

◆

318—Evolution of the Mallet

Martin Bersted Co., 1271 N. Hermitage Ave., Chicago, is distributing an envelope stuffer covering their Toughite Saf-ty Mallets. They say Toughite Saf-ty mallets outperform and outlast metal, fiber, leather and wood mallets, result in less work spoilage, and bring greater comfort in usage.

◆

319—Air Conditioning

Air Conditioning, by Charles A. Fuller, is a new book being published by The Norman W. Henley Publishing Company, 2 West 45th St., New York City—a treatise on air conditioning, air distribution, refrigeration, comfort cooling, humidification and air purification—with 576 pages and 300 illustrations, including charts, diagrams, floor plans and tables. Price $4.00.

◆

320—Lincoln Furnaces and Filtered-Aire Blower

American Foundry and Furnace Co., Bloomington, Ill., offers literature covering their Lincoln 2900 series furnace, designed for gavity heating. Another leaflet covers the Filtered-aire blower for installation on any warm air furnace, and equipped with either Throw-away or permanent type filters. Features are included.

The Lincoln 2900 furnaces are also designed for stoker-firing and forced air.

◆

321—Branford Bulletins

Malleable Iron Fittings Co., Branford, Conn., is distributing Bulletins No. 16 and 17, entitled respectively "What Are the Differences in Oil Burners," and "Here Are the Differences." The subject matter tries to make it easy to understand by taking apart one of the so-called "competition" burners and a Branford oil burner, and comparing the parts (motor, transformer, oil pump, oil filter, fan, air turbulator, valves, nose piece, electrode assembly, housing, field engineering, underwriters' listing, the manufacturer, reputation, the guaranty, price) piece by piece, and pointing out specifically what the differences are in deadly parallel.

◆

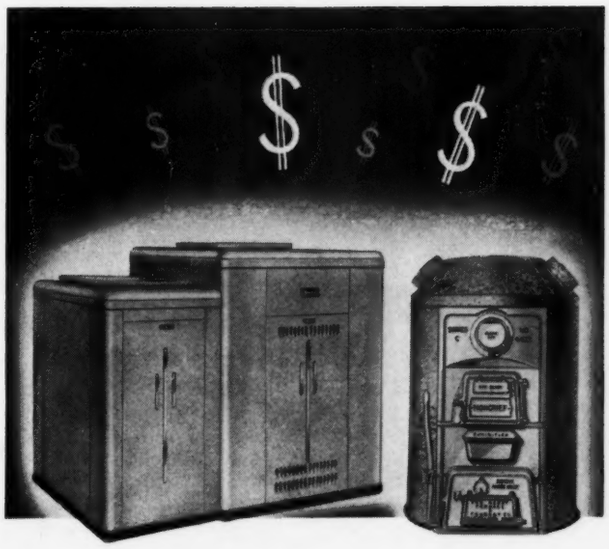
322—Heating Capacities and Fuel Consumption

Perfection Stove Co., Cleveland, Ohio, is distributing a new 16-page booklet showing Superfex oil burning heaters in full colors, a feature of which is a table giving both the fuel consumption and the heating capacities of the various models.

This table enables salesmen to figure the size of heater best adapted to the space to be heated. It also shows the maximum and minimum consumption of oil, thus making it possible for the consumer to estimate the cost of operation.

In this table the difference in requirements in various sections of the country is taken into consideration, and estimates are supplied for climates where the temperatures seldom go below 20 degrees above zero as well as for places where zero weather is not uncommon.

The table gives the figures for 15 Superfex models that are equipped with removable reservoirs and also for those same models equipped with constant level valves for connection to outdoor fuel tanks, with which an automatic electric temperature device is offered as extra equipment. There are also two models equipped with water coils for connection to hot water radiators for the heating of adjacent unconnected rooms, and two water heaters.



You Can Please Everybody With MONCRIEF

To make money, you must be able to fulfill all heating and air conditioning demands, and the complete Moncrief line gives you something to sell to everybody.

- Modern air conditioners—coal, gas, or oil fired.
- Cast and steel furnaces, including the new Moncrief LongLife with the 20-year guarantee.

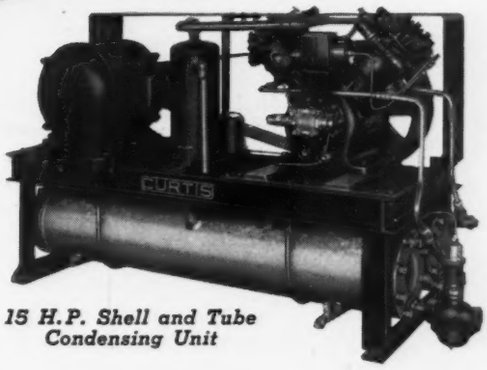
In addition, the Moncrief line includes the accessories you will need, such as blower-filter units, patented and regular pipe and fittings of every description, damper controls, draft regulators, furnace parts and many other items.

And to make this complete line a profitable business for you, Moncrief furnishes powerful advertising and sales helps . . . plus a perfected payment plan and engineering and estimating help to aid you in selling and installing every job at good profit.

Send for literature and prices.

The HENRY FURNACE & FOUNDRY Co.
3473 E. 49th St. • CLEVELAND, OHIO

Why You Serve Your Best Interests and Those of Your Customers When You *Specify* CURTIS Condensing Units



15 H.P. Shell and Tube Condensing Unit

BY RECOMMENDING CURTIS equipment you and your customers benefit by the assurance of economical, efficient, care-free performance. Check Curtis engineering details yourself, check Curtis design and construction, and you'll find reliability built into every detail.

Curtis units deliver years of trouble-free service and true operating economy under all conditions, thanks to Curtis engineering. Curtis created the exclusive patented "Centro-Ring" method of positive pressure lubrication; Curtis design includes Timken Tapered Roller Main Bearings, water-jacketed compressor heads and cylinders, drop-forged, heat-treated crankshafts and connecting rods; balanced sylphon bellows seal.

There is a Curtis model for every refrigeration and air conditioning requirement, from 1/6 to 30 h. p., air and water cooled. Counter flow, cleanable shell and tube and evaporative condenser models are available. Thousands of Curtis condensing units are in use throughout the world today.

84 years of successful manufacturing experience backs every Curtis product—including 44 years of specialization in building fine compressors. You can sell and recommend Curtis equipment in absolute confidence—for Curtis stands for *reliability* in every respect.

CURTIS REFRIGERATING MACHINE CO.
Division of Curtis Manufacturing Company
1946 Kienlen Avenue
Saint Louis, Missouri

Write today for the new Curtis folder C-68 on Air Conditioning

CURTIS REFRIGERATION
AIR CONDITIONING and COMMERCIAL

THOUSANDS OF FURNACE MEN FIND
Bigger Humidifier Profits
IN THESE THERMO-DRIP FEATURES

1 **Furnace Heat Control** gives perfect balance of indoor humidity and temperature. No mechanical parts—no hand-setting—no guesswork. It's strictly automatic.

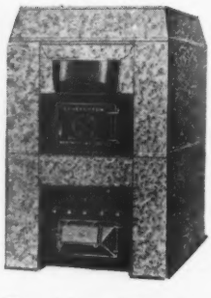
2 **Stainless Steel construction** tells prospects it's built to last and serve. Affords more for the money. Builds good-will. Leads to other sales.

3 **Low Cost** lets you offer even the modest furnace-heated home the most important part of air conditioning—regulated moisture. Cheaper to buy than most humidifiers.

Write for Complete Details Today

AUTOMATIC HUMIDIFIER CO.
18th and Main Streets CEDAR FALLS, IOWA

QUALITY EQUIPMENT-- FROM HESS-- COSTS LESS



BENEFACTOR FURNACE

• • •

A high quality welded steel furnace in three sizes, 22", 24" and 27", priced no higher than the ordinary cast-iron furnace. It gives unsurpassed value and opportunity for dealer profits.

• • •

The Hess Line is complete for every dealer requirement, including steel furnaces up to one million B.T.U. capacity, Blower Filter Units, oil burners, coal stokers.

FREE PLAN SERVICE

F.H.A. terms give dealer full payment in installment sales.
FREE Attractive consumer literature to help you make sales.

WRITE FOR DEALER PORTFOLIO
HESS WARMING & VENTILATING CO.
1211-27 S. WESTERN AVE. Founded 1873
CHICAGO, ILLINOIS

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 92.

323—Electric Refrigeration Supplies

Melchior, Armstrong, Dessau Co. of Delaware, Inc., 300 Fourth Avenue, New York City, is distributing Catalog No. 7 for 1937-1938—Electric Refrigeration Supplies with Price List No. 208-E for October, 1938. An alphabeti list of products occupies the second page.

◆

324—The Welder's Troubleshooter

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pennsylvania, offers "the Welder's Trouble Shooter," an 8-page booklet, listing the common troubles met by welders, together with the cause and cure for each. Some of the troubles mentioned are: distortion, welding stresses, cracked welds, undercut, porous welds, brittle joints and corrosion.

◆

325—Comfort Heating

American Gas Association, 420 Lexington Avenue, New York City, is offering a new salesman's handbook—Comfort Heating—which is essentially an engineering handbook for house heating and direct heating salesmen dealing with the use of gas in domestic and commercial installations. The book is not intended to be comprehensive in its engineering treatment, but has been designed to reduce the engineering work to a minimum and to provide tables which the average salesman can soon learn to use.

◆

326—Peerless Package Units

The Peerless Electric Co., Warren Ohio, is distributing a two-page folder illustrating and describing Peerless belt-drive blowers and package units for warm air furnaces—for conversion jobs or for new installations. Outstanding features claimed are: Peerless motor specially built for blower duty, automatic belt tension device, blower wheels statically and dynamically balanced, ample filter capacity, attractive streamlined heavy gauge cabinet, automatic bonnet control, two large access doors, complete assembly ready to install. Capacities are listed.

◆

327—Small Home Year Book

National Small Homes Bureau, Inc., 572 Madison Avenue, New York City,—W. "Waddy" Wood, president—has just published 1,000,000 copies of "Small Home Builders Year Book," 1938-1939 Edition, of which one-third will be sold on 40,000 newsstands. The remainder is available for distribution through the many local factors of the industry to promote the building of homes at small cost.

64 pages and cover—8½x11 in.—in eight colors, the book covers the complete small home story from finance to furniture. Besides the lead section, which deals with building costs, architectural styles, etc., there are six sections such as "Design Your Home to Suit Your Needs" which carries 19 house designs, including the 8 of National Small Homes Demonstration, 6 Certigrade, 3 concrete and 2 brick. The construction section has a four page article describing the difference between good and "jerry" wood construction.

There is space for imprinting name, address, telephone number, etc., on the bottom of the front cover, which has a McClelland Barclay painting of a young couple holding a model of their own Home. There is a charge for imprinting. Also, the back cover has been designed for a special dealer advertisement and imprint. It shows by six steps, in popular photo-cartoon strip, a typical couple deciding to build a home of their own.

There are a number of successful methods of using "Small Home Builders Year Book" to get new home building business. At any demonstration house they are used as an "opening" to get the prospect's name on a card. A number of dealers have used them in newspaper ads.

Stoker Dealers . . . YOU CAN FIRE SCOTCH MARINE TYPE BOILERS SUCCESSFULLY WITH

KōL-MASTER Stokers

Stop losing stoker sales because your stoker can't fire Scotch-Marine and similar long, narrow fire-box boilers and furnaces successfully! Sell Kol-Master , . . then there's no need to build "dutch ovens" or to try any other make-shift arrangement! Kol-Master is installed right in the fire tube, provides more combustion space than original hand-fired grates! Kol-Master maintains proper combustion conditions with its patented, exclusive automatic combustion control; secures uniformly even coal distribution full length of the fire box with its patented, exclusive long, narrow retort . . . dividing plates . . . "reverse-flight" feed screw. *Only* Kol-Master can fire these tough jobs *so successfully!* Get details. We will gladly cooperate with all stoker dealers who are not directly in competition with Kol-Master dealers.

KōL-MASTER CORP., Oregon, Ill.

For Every Heating Plant Purpose

THARCO PLASTIC CEMENTS

ASBESTOS FURNACE CEMENT

For years, the country's leading furnace manufacturers and repair men have used and approved Tharco. Why? Because Tharco has met every necessary requirement. It's a plastic, easy working cement that adheres to *both* sides in a joint. Will not shrink and, if properly applied, will not honeycomb or powder.

Prove its superiority

WRITE FOR FREE SAMPLE

Try These Tharco Leaders

STOVE-BOILER PUTTY

For setting and mounting stoves and boilers

HI-HEAT CEMENT

For mounting circulators; works like putty

MANUFACTURED ONLY BY
THE ARMSTRONG COMPANY
DETROIT DALLAS CHICAGO

ARE YOU BEHIND THE 8 BALL?

Do your customers call you in because their warm air furnaces do not "Deliver the Goods."

Peerless Blowers

and Furnace Fans Solve This Problem

DEALER PRICES $15.75 to $110.00

Write Today for Details

FAN & BLOWER DIVISION

THE PEERLESS ELECTRIC CO.
WARREN, OHIO

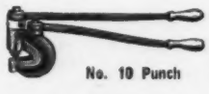
Bending Brakes **WHITNEY-JENSEN** Metal Tools

20 ga. Portable Brake

BENDING BRAKES

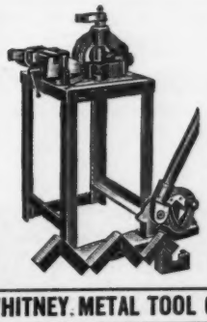
● Whitney-Jensen Brakes are famous for unique design permitting quick change-over from straight bending to box and pan work. Box section welded construction provides greater strength, stiffness, accuracy, and durability with lighter weight. Three types available—20 ga. Portable "Air Conditioning Special," 18 ga. Combination, and 12-14-16 ga. Combinations. Write for circulars giving complete details.

18 ga. Combination Brake



No. 10 Punch

Nos. 7, 7½, 8—Imperial Punches



PUNCHES

● Whitney-Jensen manufactures a complete line of easy-working, accurate, reliable Punches world-famous for quality and satisfaction. They are "Tools You Need Today."

ANGLE IRON MACHINES

● The No. 455 Combination unit shown has a shear, notcher, and bender, all mounted on a sturdy welded stand. Capacity 2"x2"x¼" angle iron and lighter. Very useful.

WHITNEY METAL TOOL CO. • 91 Forbes Street, Rockford, Illinois

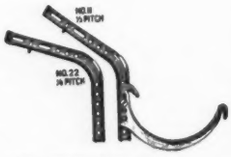
-BB-

THE ONLY COMPLETE QUALITY LINE

No. 30 SHANK

The shank with twelve distinct adjustments. The shank that is designed to *Lick That Tough Job!*

Nos. 11 and 22 Shanks made especially for side rafter attachment, this combination will take care of any pitch. Equipped with the



NEW STARTING TEAT

which is a small wedge shaped prong, that, when tapped lightly will hold the shank securely in place—leaving both hands free for the use of nail and hammer.

We manufacture our complete line of hooks and hangers in black and tinned steel, as well as copper and Tuf-Bronze—A story in itself.

Write for Complete Descriptive Literature

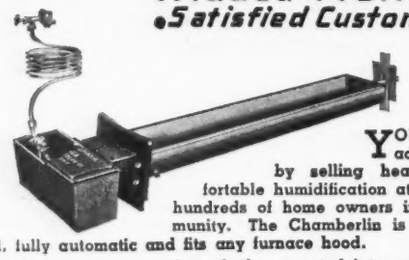
BERGER BROS. COMPANY

229-237 Arch St.
PHILADELPHIA, PA.

BRANCH
16th and Grove Sts.
JERSEY CITY, N. J.

How the CHAMBERLIN Automatic Humidifier

Gives You... *Dependable Service*
Added Profits
Satisfied Customers



YOU will get added profits by selling healthful, comfortable humidification at low cost to hundreds of home owners in your community. The Chamberlin is easy to install, fully automatic and fits any furnace hood.

The large water way through the patented integrally cast trap assures free flow without liming. A long float rod on the improved valve, which is entirely above the water line, gives positive water shut-off at any pressure. Cast entirely in one piece and finished in durable baked enamel. Vapor pan is 3" deep but carries only 1" of water to insure rapid evaporation.

Manufactured by a pioneer in this field, the Chamberlin combines dependability and attractive prices to make it a real business-getter for you. Thousands now in use. Write today for prices and free circular.

Manufactured by
CHANDLER COMPANY
Cedar Rapids, Iowa

New Literature . . . .

For your convenience in obtaining copies of new literature, use the coupon on this page.

328—Cabinet Top Grilles

Hart & Cooley Manufacturing Co., Holland, Michigan, has just issued Catalog No. 38CT on Cabinet Top Grilles, published particularly for the manufacturers of cabinets for oil or coal burning stoves, room coolers, air conditioners, etc.

This catalog shows five different designs of grilles in different price ranges and the catalog has complete data on construction, air capacity, prices, etc.

◆

329—Planing Mill Exhausters and Volume Fans

National Association of Fan Manufacturers, 5-208 General Motors Building, Detroit, has available for distribution a leaflet in which is tabulated fair comparison charts of "Planing Mill Exhausters" and "Cast Iron Volume Fans" as well as illustrating the standard methods for arrangement of drive and designation of direction of rotation and discharge. These fans have a wide variety of application in the industrial field, such as conveying materials, removing dust and factory waste, handling gases or fumes where the usual type of ventilating fan is not suitable and delivering air at medium pressures.

◆

330—Certified Steels

Joseph T. Ryerson & Sons, Inc., 16th and Rockwell, Chicago, is distributing a booklet covering their Certified Steels. To overcome the variation in different heats of alloy steels even within one S. A. E. specification, Ryerson has developed a specification within a specification for every alloy—a narrow range for every element so that the alloy will respond favorably to the heat treatment required for the most exacting industrial applications.

Ryerson sheets are made only from the best part of the coil. No seconds are ever carried. Sheets are carefully selected for finish, flatness, gauge and size accuracy. They are stored in heated warehouses which preserve their surface finish. Each different kind of sheet is tested to see that it has the qualities specified. Deep drawing sheets are tested for ductility and deep drawing qualities. Long Terne sheets are furnished to a special surface specification with dark oiled finish. Cold rolled sheets must meet a special gauge tolerance, flatness specification and Rockwell hardness limit. They have a special de-oxidized finish. Cold rolled strip steel is held to definite gauge and hardness limits and is especially surfaced to better take nickel and chrome finishes.

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Please ask the manufacturer to send me more information about the equipment mentioned under the following reference numbers in "New Products" and "New Literature."

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227	228	229	230	231	232	233
234	235	236	237	238	239	240
241	242	243	244	245	246	247
248	249	250	251	252	253	254
255	256					
317	318	319	320	321	322	323
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Are you Manufacturer——Jobber——Dealer——

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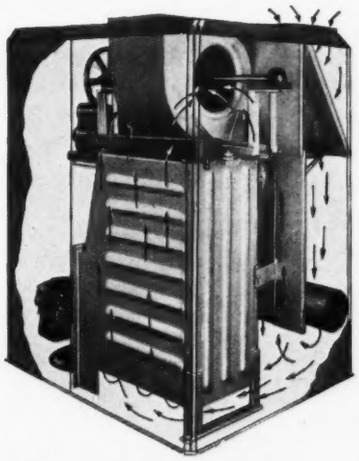

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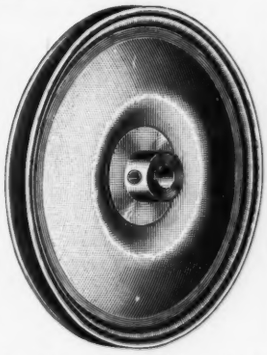

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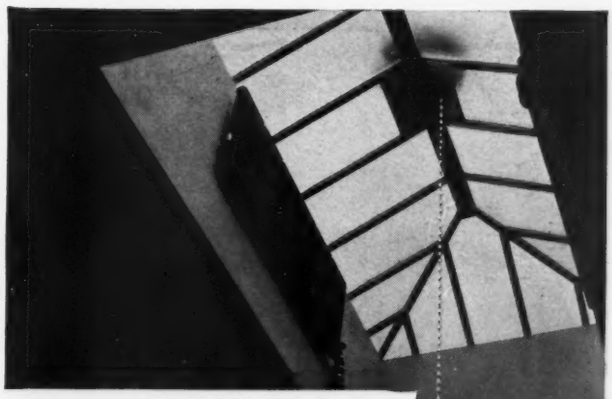

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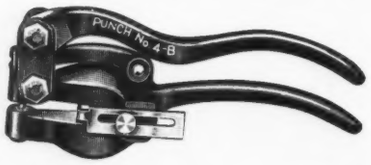

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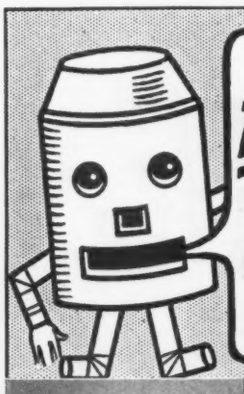

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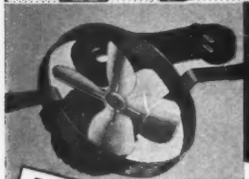

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839 Reading Road Cincinnati, Ohio

News Items . . . . . .

Thorpe at Independence, Missouri

Harry Thorpe, who has sold furnaces in Missouri, Kansas, Iowa, Nebraska and Illinois for the past 20 years, is opening up a complete furnace and air conditioning establishment to be known as Thorpe and Son, Inc.—winter heating and summer cooling—at 308 N. Spring Street, Independence, Missouri.

◆

Air Conditioning Heating Company

Air Conditioning Heating Co., a division of Cadillac Auto Refinishing Shop, 205 N. Mitchell St., Cadillac, Michigan, is handling the Lennox line and Combustioneer stoker. The company entered the heating and air conditioning field recently.

G. W. Johanson, secretary and treasurer, is heating engineer. L. G. Johnson is president and general manager.

◆

Salem, Oregon Ordinance

(*Continued from page* 68)

Section 10. To determine the capacity of gas burning furnaces normally rated in certified heat input rate, the following formula shall be used to obtain the ratings in terms of leader pipe area:

$$L = \frac{H_1 \times 0.75 \times 0.70}{136}, \text{ where}$$

L = leader pipe area in square inches, and
H_1 = certified heat input rating in Btu per hour.

Section 11. In second floor duplex flats or apartments where separate heating plants are used, furnaces installed shall have 30 per cent more leader pipe capacity than the total net calculated area as determined in section 1, but the actual pipe areas used shall not be increased.

Section 12. Every warm air furnace shall be equipped with a water pan or other humidifying device.

◆

Floor-Ceiling Temperature Difference

(*Continued from page* 48)

Acknowledgments

The results presented in this paper were obtained in connection with the investigation of warm-air furnaces and heating systems in the Research Residence,[11] at the University of Illinois, conducted by the Engineering Experiment Station of which M. L. Enger, Dean of the College of Engineering, is the director, and in the Department of Mechanical Engineering of which O. A. Leutwiler, Professor of Mechanical Engineering Design, is the head. This investigation is a cooperative project sponsored by the National Warm Air Heating and Air Conditioning Association and the Engineering Experiment Station. These results will ultimately comprise part of a bulletin of the Engineering Experiment Station. Acknowledgments are also due to: R. B. Engdahl, research graduate assistant, and to J. S. Cunningham, former research assistant, for services rendered in connection with the investigation, and to the various manufacturers who cooperated by furnishing instruments and equipment.

[11] The Research Residence in Urbana, Illinois was built, furnished, and completely equipped specifically for research work in warm-air heating by the *National Warm-Air Heating and Air Conditioning Association* in December, 1924.

"2 x 1 = 2"

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Allen Turbine Ventilator (Electro-Wind Type) provides normal ventilation by cost-free gravity operation under normal conditions. Then when special conditions require greater suction, trip the switch and the motor instantly provides double the power,—double the draft. (This high utility ventilator, as well as other types, described in detail in our literature; a set free for the asking.)

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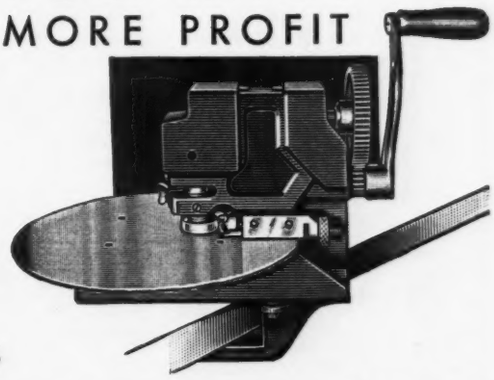

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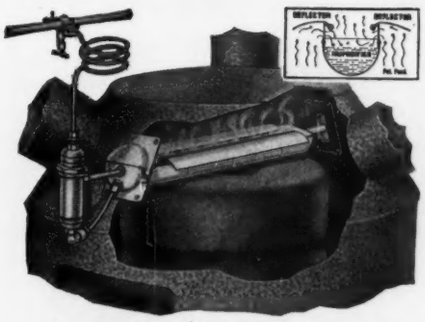

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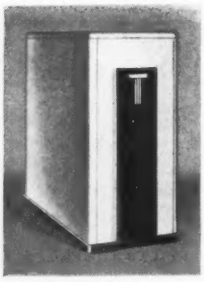

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METALBESTOS is not a pipe used INCIDENTALLY for venting gas appliances—it is made expressly for that purpose. Its performance over a period of years more than justifies our claims as to its merits.

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The installation of METALBESTOS guarantees proper draft—Safety—Durability and low installed costs.

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We are interested in your METALBESTOS GAS VENT and FLUE PIPE. Send along your catalog and price list!

NAME .....
STREET ADDRESS .....
CITY and STATE.....

Heat Conservation

(*Continued from page* 64)

to be installed. In estimating the fuel requirements for the season, we must deal with average infiltration losses which would, for most localities, be based on wind velocities of the order of seven miles per hour. It is, therefore, evident that weatherstripping will reduce the maximum loss and the investment in heating plant to a greater degree than it can reduce the fuel consumption and cost for the whole season. It is also evident that for those rooms where windows are opened at night and for the time the windows are open, the fact that the windows are weatherstripped can have no effect on fuel consumption. The same reasoning applies to double windows in so far as they are depended upon to decrease infiltration losses.

The figures used in our calculations have been taken from the data presented in the A. S. H. V. E. Guide. These figures show that for the typical structure that we are studying, the air changes due to infiltration with a seven-mile wind amount to considerably less than one change per hour. They, also, show that while weatherstripping will save 11.8% of the total heat loss for the house for the maximum hour, and will consequently allow us to reduce our boiler and radiator sizes in this proportion, it will save less than 2% of the fuel used per season.

The same figures also show that if weatherstripping is planned when the house is built and the heating plant reduced accordingly, the saving in heating plant should pay for two-thirds (⅔) of the cost of weatherstripping, so that the return on the net investment is 14% and decidedly worth while. In addition to this tangible saving in cost of fuel, weatherstripping will undoubtedly add very largely to the comfort of the occupants by preventing drafts and helping to maintain even temperatures in all parts of the rooms.

Double Windows and Storm Doors

Double windows and storm doors are not in general used throughout the country. It is only in those northern regions where zero and lower temperatures are experienced each year that their use is general. There is no argument as to the very decided saving that they produce. Their more general use has undoubtedly been prevented by the difficulty and bother of putting them up for the winter, taking them down and storing them for the summer, and painting and keeping in repair. In our figures we have endeavored to make an allowance for the operating cost represented by these factors.

Our figures show that if storm doors and windows are planned when the house is built, we may save nearly 25% of our heating plan capacity and 12% of our fuel. This saving in plant capacity should more than pay for their cost if they are built with the building. We find a return of 22% of our net cost and 18.5% on the gross cost if they are installed after the house is built. We believe these figures prove them to be one of the most important and efficient of the heat conservation measures that are possible.

[To be continued]

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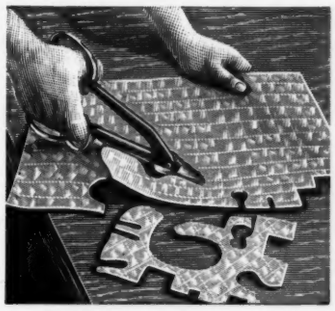

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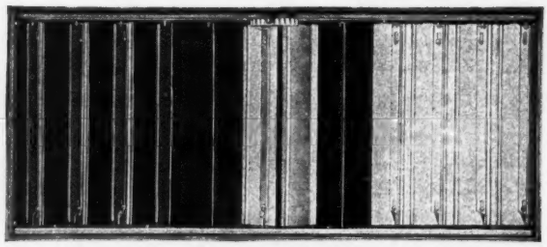

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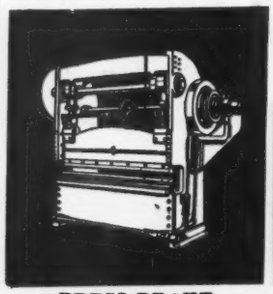

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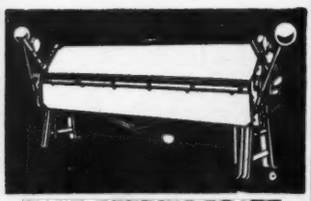

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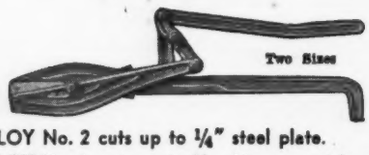

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CHECK YOUR HEATING INSTALLATIONS
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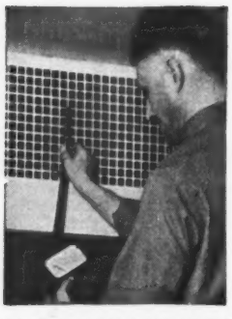

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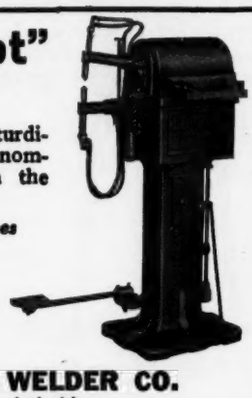

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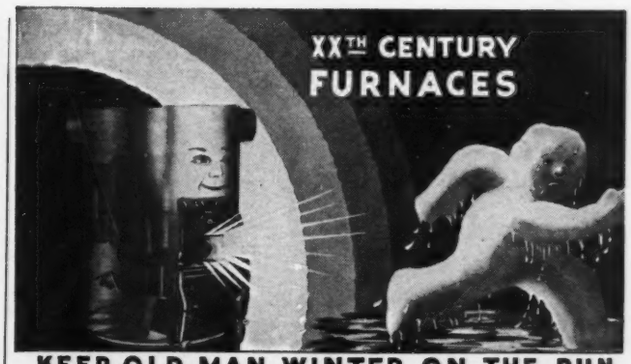
Takes less material to set a furnace.
Is not affected by temperature changes.
Comes to you in dry form.

Send for free sample.

PYROLITE PRODUCTS CO.
1221-31 WEST 74TH ST. CLEVELAND, OHIO



KEEP OLD MAN WINTER ON THE RUN
XX TH CENTURY HEATING & VENTILATING CO.
AKRON, OHIO

How to Sell Furnaces and Repairs
WITH
The TORNADO Furnace Cleaner

The TORNADO gets you into the basement where it is easy to sell repairs and new furnaces. And you make a profit on the cleaning job too!

Dealers say that the TORNADO is the most powerful furnace cleaner built. Leads the field! Low price—easy payments—free trial. Approved by Anthracite Institute and Underwriters Lab. Thousands in use.

Write now for complete information.

Breuer Electric Mfg. Co.
5082 Ravenswood Avenue, Chicago, Ill.

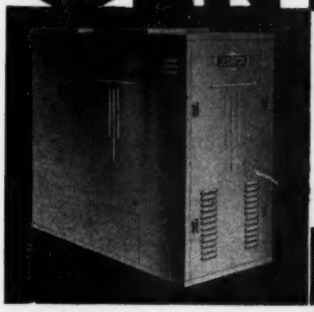
FORTIFIED

The semi-precious elements which have been scientifically combined to produce genuine Lyonore Metal present a united front against the destructive forces of time and weather. To assure lasting satisfaction, specify and use genuine Lyonore Metal for all sheet metal requirements!

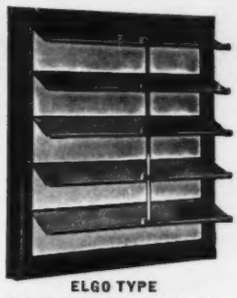
LYON, CONKLIN & CO. Inc.
Baltimore, Maryland

Lyonore Metal
CHROMIUM — NICKEL — COPPER — IRON ALLOY

CENTURY
ZEPH-O-LATOR
85%
OVERALL EFFICIENCY



CENTURY ENGINEERING CORP.
CEDAR RAPIDS IOWA



ELGO TYPE

Get our prices on Automatic Shutters, Stationary Shutters, Hand Operated Shutters, Ceiling Dampers, Balanced and Back Draft Dampers.

Elgo Ventilating Specialties

A Shutter with Unusual Features!

An automatic shutter that not only opens more quickly but also closes more tightly. Completely weather-stripped around the inner edge of the frame to make a snug, tight fit. Noted also for absence of blade flutter. And it has swivel joints that never get loose or rattle. Sizes from 10" to 60" square—also rectangular.

Write for circular and prices.

ELGO SHUTTER & MANUFACTURING CO.
634 W. Warren Detroit, Mich.

Free CATALOG

JUST A MINUTE!

● *Did you make a note of the important announcement on page 22?*

AT THE CENTER OF THINGS

RATES FROM $3.00

CORONADO HOTEL
SPRING AT LINDELL
SAINT LOUIS MISSOURI
Preston J. Bradshaw, Director

FOUR FAMOUS RESTAURANTS

YOUR salesmen know him. He resorts to every subterfuge to evade the issue . . . to avoid saying "yes" while a salesman is present. He's afraid that the salesman's personality is influencing him. So he retreats behind a defensive mask of uncertainty. His stock answer is an evasive "I'll think it over" or "Have to discuss it with my associates". All a pose! He just wants to be *alone* when he makes up his mind.

It is when he is alone that he reads AMERICAN ARTISAN. He isn't evasive then. He's looking for progressive ideas about warm air heating, air conditioning and sheet metal contracting and news of the warm air heating, air conditioning and sheet metal contracting field. In AMERICAN ARTISAN he is receptive to printed ideas—and that goes for the advertising pages, too. Your advertisement in AMERICAN ARTISAN gives you the chance to get in some good licks between your salesman's call and the Evasive Guy's final decision.

Highest editorial standards and publishing integrity.

ABP

AMERICAN ARTISAN

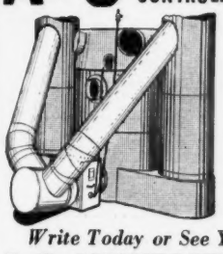
bears the two hall-marks of known value

ABC

Proved reader interest in terms of paid circulation.

AMERICAN ARTISAN Service Section

A-C THERMOSTATICALLY CONTROLLED AUTOMATIC



HEAT BOOSTER

Everything the Home Owner wants in a Furnace Fan—At a price Every Furnace Owner Can Afford to Pay.

Write Today or See Your Jobber

A.-C. MANUFACTURING CO.
PONTIAC ILLINOIS

CUT YOUR COSTS by Spot Welding

WITH **ACE** SPOT WELDERS

Cheaper, better and faster than riveting.

Built for production service. Engineered to meet practical requirements of sheet metal shops. Made in sizes from 5 K. W. up.

Only **$90**

for Series 62.
Welds 2 pcs. 16 Ga. Steel.
Send for free literature.

PIER EQUIPMENT MFG. CO.
Welding Equipment Division
726 Cross St., Benton Harbor, Michigan

BEVERLY THROATLESS SHEARS

are indispensable to the modern, up to date sheet metal shop. Light, portable, yet extremely strong, they will make your shearing operations much faster, neater and more economical thru time saved on the job. They are made in two sizes to handle up to 14 or 10 gauge metal and are very reasonably priced.

Write today for literature and prices.

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3009 W. 110TH PLACE. DEPT. 3. CHICAGO

Classified

SITUATIONS OPEN

OIL BURNER SALESMEN WANTED

PART-TIME Men Acceptable

Plans for expanded operation require that we add a number of good oil burner salesmen to our present staff. Excellent opportunity for high-type men. PART-TIME men acceptable in certain territories. Give full details of experience in first letter. All applications strictly confidential, but initial contact must be by mail. NO PERSONAL INTERVIEWS granted until application has been made by letter. HART OIL BURNER CORP., Desk B, Peoria, Ill.

SALESMEN WANTED—One of the largest and oldest manufacturers in the heating and air conditioning industry has openings for experienced, aggressive salesmen in the following territories: 1. Southwestern States; 2. Midwestern States; 3. Atlantic Seaboard. Complete line of nationally advertised coal, oil and gas-fired equipment, also registers, grilles, prefabricated and gravity furnace pipe and fittings. Warehouse stocks adjacent to Midwestern and Atlantic Seaboard territories. Give complete information in first letter, including previous experience, sales record, references and acquaintance with heating trade. Include recent snap-shot photo, if available. Address Key No. 444, American Artisan, 6 No. Michigan Ave., Chicago, Ill.

HEATING SALESMAN WANTED—We have openings for five thoroughly experienced heating salesmen. Do not apply unless your experience covers calculating heat losses, laying out forced air heating systems, servicing coal, oil and gas fired units. Address The Rudy Furnace Company, Dowagiac, Mich.

FOR SALE

FOR SALE—Will sacrifice the following excess inventory—as a whole or in part—
20 12″ (Lau) Blower Wheels—Double Width
20 P. S. Housings for above.
75 10″ (Lau) Blower Wheels—Double Width
75 P. S. Housings for above.
500 15/16″ Randall Pillow Blocks
500 15/16″ Randall Bronze Collars
90 5½ quart Rega Atomizers
75 7 quart Rega Atomizers
10 8 quart Rega Atomizers
Make offer—advise quantity.
Address Key No. 445, American Artisan, 6 No. Michigan Ave., Chicago, Ill.

SERVICE SECTION: Rates—$5.00 per inch per insertion. One inch minimum. CLASSIFIED SECTION: 5 cents for each word including heading and address. Count seven words for keyed address. $1.00 minimum. Cash must accompany order.

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Can double the usual savings.

WE

would be pleased to mail you our latest stock list covering everything in metal working machinery — listing many real bargains in our huge stock of more than 2000 machines of all makes, models, types and sizes.

INTERSTATE MACHINERY CO., INC.
107 S. Clinton St., Chicago
(Free Parking)

THE Cold Room problem can be solved by using a *One Pipe Booster* Fan to force warm air into the room. May also be used in cold air returns. Easily installed. Made in all sizes. Furnished either with plain mounting or encased, as illustrated. Variable speeds may be had by using our *Control* Box which fits any model Booster Fan since 1933.

Write for prices and literature.

Brumme Manufacturing Co.
314 S. Artesian Ave. Chicago, Ill.

IT'S CHIMNEY TOP TIME

Accurate Revolving Ventilators, used with the Accurate Cast Base make Good Chimney Tops. Simple in Design. Durable in Construction. Storm and Rain Proof. Positively Prevents Down Draft. Certified Ratings. Popularly Priced. See Your Jobber.

The Accurate Unit stops down drafts on oil and gas fired units.

ACCURATE MFG. WORKS
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SHAMBLEN SERVICE

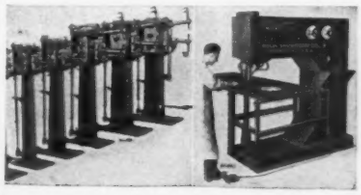
is known throughout the trade. Your order filled when and how you want it and with parts that are guaranteed to fit.

Try us with your next repair job. Our service and repair parts cannot be excelled. No order too large, none too small. Write today for catalog and further particulars.

SHAMBLEN FURNACE PARTS COMPANY
231-39 First Avenue Pittsburgh, Pa.

"DO-ALL" Combination Electric Hammer & Drill

drills both concrete and metal. Cap. 1¼" in concrete—⅝" in metal. Saves time and money in setting expansion bolts, anchors and plugs. Soon pays for itself. Easy to maintain. Bulletin 381.
Wodack Electric Tool Corporation, 4844 W. Huron St., Chicago, Ill.



Electric welding equipment of every description to weld from a watch case to a door. Also special welding machines, spot, butt, seam, a. c. arc welders in sizes from ¼ to 500 KVA. Ask for our catalog No. 38-WT. Also production job welding.

EISLER ENGINEERING CO., Inc.
761 S. 13th St. NEWARK, N. J.

YOU CAN USE THEM, TOO

Your business needs these wonderful business builders. Let us show you how other firms are using PHOTO-AD CARDS to their advantage. Samples free.

Graphic Arts Photo Service
275 Market Street, Hamilton, Ohio

¼" RIBBED WIRE GLASS

Shipments anywhere F.O.B. our warehouse.
13c per sq. ft. plus boxing.
Stock Sheets—Case lots.
Quotations on cut sizes on application.

T. J. ATCHESON GLASS CO.
955 MAIN STREET BUFFALO, N. Y.

Index to Advertisers

Firms represented in this issue are identified by the folio of the page on which their advertising appears. Advertising which appears in other issues is marked with an asterisk.

☆ ☆ ☆

A. C. Mfg. Co. 101
Accurate Mfg. Works 101
Acme Electric Welder Co. 98
Advance Appliance Co. ..... *
Aerofin Corp. 11
Air Conditioning Products Co. 97
Air Controls, Inc. 85
Aldrich Co. 97
Allen Corp. 95
American Air Filter Co., Inc. 20
American Brass. Co. 16
American Rolling Mill Co., The 18
American Warming & Ventilating Co. *
Anemostat Corp. of America ..... *
Annis Air Filters ..... *
Anthracite Industries, Inc. 3
Armstrong Co., The 91
Atcheson Glass Co., T. J. 101
Auer Register Co. 80
Automatic Humidifier Co. 90

Barber-Colman Co. ..... *
Barber Gas Burner Co., The 66
Bead Chain Mfg. Co. 93
Berger Bros. Co. 92
Beverly Shear Co. 101
Binkler Mfg. Co. 95
Brauer Supply Co., A. G. 97
Binkley Mfg. Co. 95
Breuer Electric Mfg. Co. 99
Brumme Mfg. Co. 101
Buffalo Forge Co. 21
Burt Mfg. Co. ..... *

Capitol Furnace & Stove Repair Co. ..... *
Central Furnace & Stove Repair Co. 96
Century Electric Co. 15
Century Engineering Corp. 99
Chalmers Oil Burner Co. ..... *
Chandler Co. 92
Clarage Fan Co. 88
Cook Electric Co. 79
Coronado Hotel 99
Crescent Tool Co. 19
Curtis Refrigerating Machine Co. 89

Dail Steel Products Co. 93
Detroit Lubricator Co. 44
Dreis & Krump Mfg. Co. 98

Eckenroth Register Co. ..... *
Eisler Engineering Co. 101
Electric Vacuum Cleaner Co., Inc. ..... *
Elgo Shutter & Mfg. Co. 99

Farrell-Cheek Steel Co. ..... *
Fitzgibbons Boiler Co., Inc. 9

General Electric Co. ..... *
Gleason-Avery, Inc. ..... *
Goese Mfg. Co. ..... *
Grand Rapids Furnace Cleaner Co. 97
Graphic Arts Photo Service 101
Gray, G. L. ..... *

Harrington & King Perforating Co. 86
Hart & Cooley Mfg. Co. 8
Henry Furnace & Foundry Co., The 89
Hess Warming & Ventilating Co. 90
Hussey & Co., C. G. 14

Illinois Testing Lab., Inc. 98
Independent Register Co., The 17
International Nickel Co., Inc. 5
Interstate Machinery Co. 101

Johnson Gas Appliance Co. 97

Kent Co., The 98
Kol-Master Corp. 91

Lamneck Products, Inc. ..... Inside Front Cover
Lau Blower Co. 76
Libert Machine Co. ..... *
Lincoln Electric Co. 87
Lochinvar Corp. ..... *
Lohman, Inc., Wm. J. 83
Lyon-Conklin & Co. 99

Maid-O'-Mist, Inc. 95
Malleable Iron Fittings Co. ..... *
Marshalltown Mfg. Co. ..... *
Maurey Mfg. Co. 93
Meyer & Bro. Co., F. 77
Meyer Furnace Co. ..... *
Michigan Tank & Furnace Co. ..... *
Milcor Steel Co. ..... Outside Back Cover
Minneapolis-Honeywell Regulator Co. 7
Monmouth Products Co. 12
Morency-Van Buren Div., Scovill Mfg. Co. ..... *

Niagara Machine & Tool Works 83
Northwestern Stove Co. ..... *

Osborn Co., J. M. & L. A. 75
Owens-Illinois Glass Co. ..... *

Pacific Gas Radiator Co. 84
Par Appliances, Inc. ..... *
Peerless Electric Co. 91
Peerless Foundry Co. 97
Peninsular Stove Co. ..... *
Penn Electric Switch Co. 85
Perfect Burner Co. ..... *
Perfection Stove Co. 96
Pier Equipment Mfg. Co. 101
Practical Instrument Co. 97
Premier Division, Electric Vacuum Cleaner Co., Inc. ..... *
Premier Furnace Co. ..... *
Pyrolite Products Co. 99

Randall Graphite Products Corp. 65
Register & Grille Mfg. Co. 98
Republic Steel Corp. 24
Rock Island Register Co. ..... *
Ruby Chemical Co. ..... *
Rybolt Heater Co. 80
Ryerson & Son, Inc., Joseph T. 13

St. Louis Furnace Mfg. Co. 95
Sall Mountain Co. 86
Schaefer Brush Mfg. Co. 98
Schwitzer-Cummins Co. ..... *
Scovill Mfg. Co. ..... *
Shamblen Furnace Parts Co. 101
Skilsaw, Inc. ..... *
Skuttle Humidifier Co., J. L. 88
Superior Sheet Steel Co. ..... *
Swartwout Co., The 79

Trane Co., The 23
Tuttle & Bailey, Inc. ..... *
Twentieth Century Heating & Ventilating Co. 99

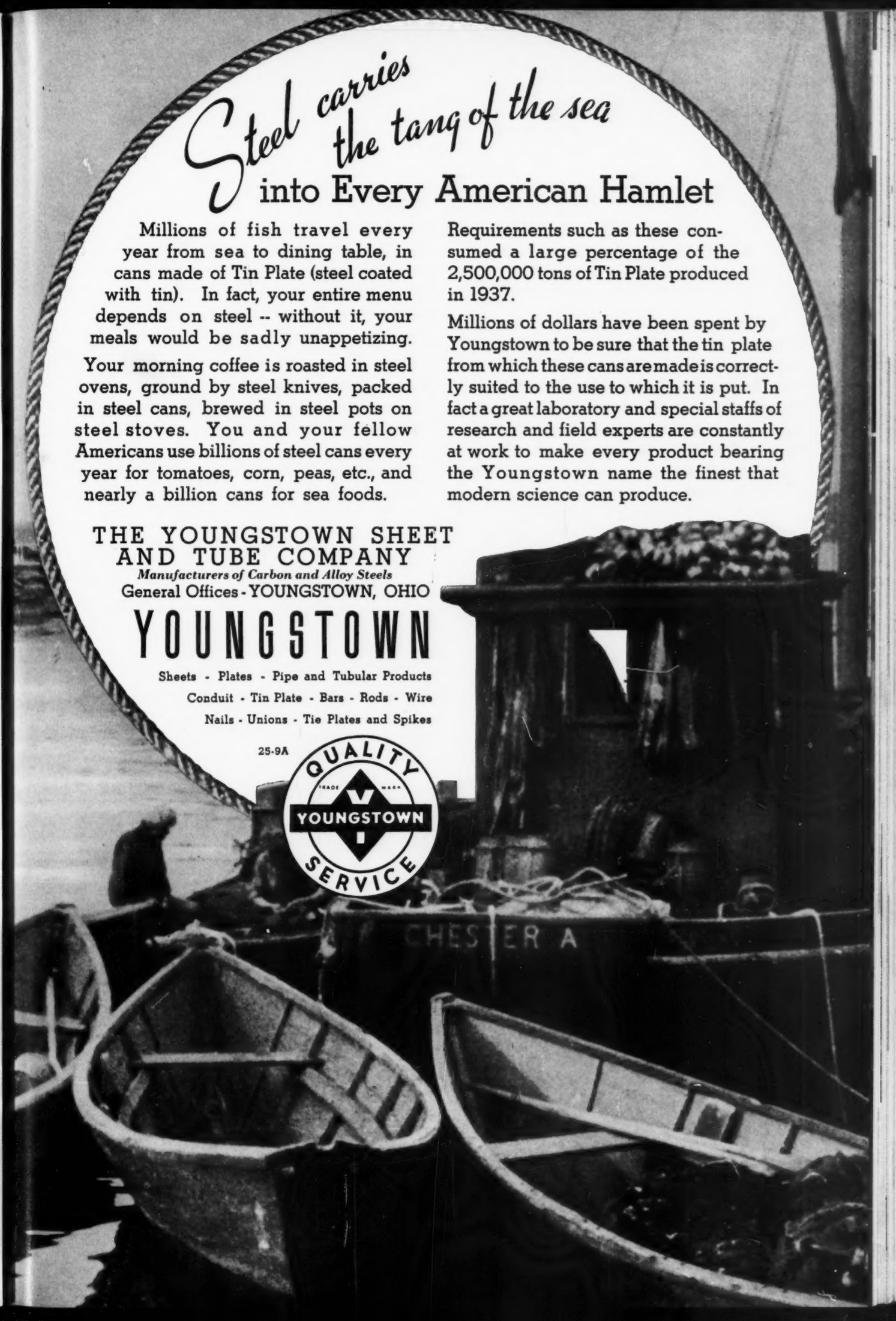
U. S. Air Conditioning Corp. 82
U. S. Register Co. 6
U. S. Steel Corp. 10
Utilities Engrg. Institute ..... *
Utility Fan Corp. 81

Victor Elec. Products, Inc. 94

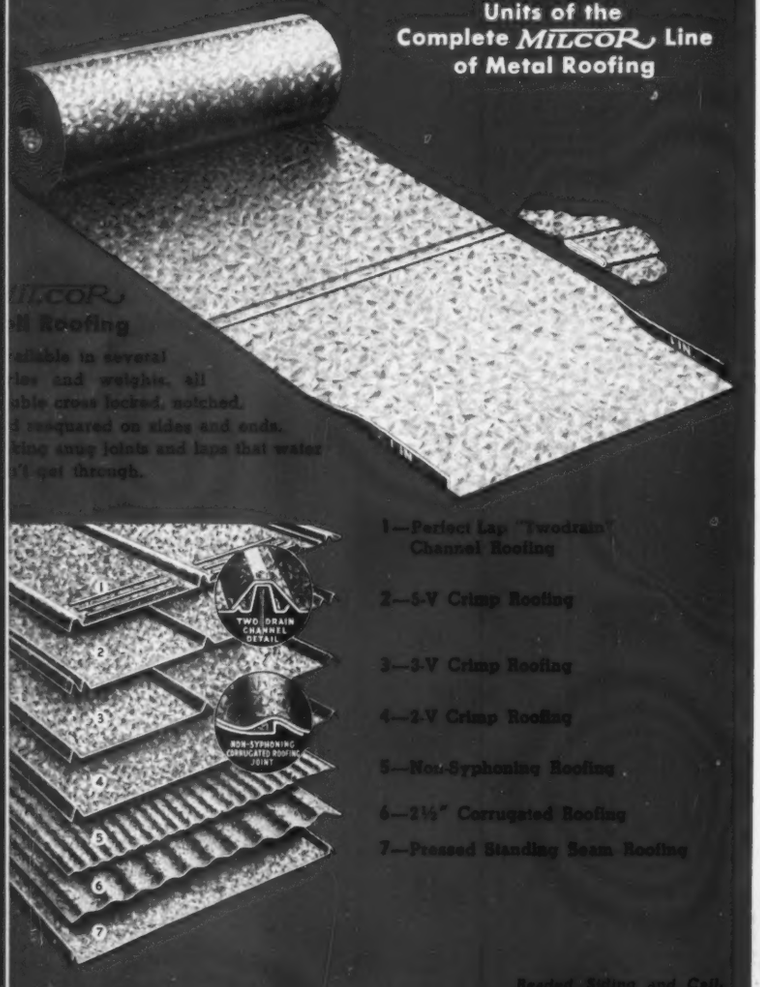
Ward Machinery Co. 93
Waterloo Register Co. ..... *
White Mfg. Co. 87
Whitney Mfg. Co., W. A. 94
Whitney Metal Tool Co. 91
Williams-Wallace Co. 96
Williamson Heater Co. ..... *
Wilson, Inc., Grant 78
Wise Furnace Co. ..... *
Wiss & Sons Co., J. 97
Wodack Elec. Tool Corp. 101

XXth Century Heating & Ventilating Co. 99

Youngstown Sheet & Tube Co. ..... Inside Back Cover


Steel carries the tang of the sea
into Every American Hamlet
Millions of fish travel every year from sea to dining table, in cans made of Tin Plate (steel coated with tin). In fact, your entire menu depends on steel -- without it, your meals would be sadly unappetizing.
Your morning coffee is roasted in steel ovens, ground by steel knives, packed in steel cans, brewed in steel pots on steel stoves. You and your fellow Americans use billions of steel cans every year for tomatoes, corn, peas, etc., and nearly a billion cans for sea foods.
Requirements such as these consumed a large percentage of the 2,500,000 tons of Tin Plate produced in 1937.
Millions of dollars have been spent by Youngstown to be sure that the tin plate from which these cans are made is correctly suited to the use to which it is put. In fact a great laboratory and special staffs of research and field experts are constantly at work to make every product bearing the Youngstown name the finest that modern science can produce.
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
General Offices - YOUNGSTOWN, OHIO
YOUNGSTOWN
Sheets - Plates - Pipe and Tubular Products
Conduit - Tin Plate - Bars - Rods - Wire
Nails - Unions - Tie Plates and Spikes
25-9A
QUALITY
YOUNGSTOWN
SERVICE

Say, you can *really build your business* with MILCOR Metal Roofing *for farm buildings*



Units of the Complete MILCOR Line of Metal Roofing

1—Perfect Lap "Twodrain" Channel Roofing

2—5-V Crimp Roofing

3—3-V Crimp Roofing

4—2-V Crimp Roofing

5—Non-Syphoning Roofing

6—2½" Corrugated Roofing

7—Pressed Standing Seam Roofing

Quick service from *five factories* — *complete line* of dependable products — and *profits* for you

Farmers want better roofs—metal roofs that they can bank on for dependable protection against the weather. You want more jobs — *profitable* jobs. When you go after that farm business with Milcor Metal Roofing, you and the farmer profit.

The big, complete Milcor line of metal roofing and siding is a *profitable* line for you. It gives the farmer a job he's proud of — a job he likes to tell his neighbors about. What's more, he's glad to recommend you to them. Milcor is the "quick-service line," with five big plants conveniently located and ready to ship your orders "pronto," without delay.

You can depend on the quality of every Milcor product. Take Milcor Roll Roofing. It's easy to lay, resquared on sides and ends, and has the famous Double Cross Lock, a strong, snug joint.

So "go to town" this season with Milcor. See your Milcor Price Book for details on the line and colorful, practical sales help material. If you don't have our latest price book, write for it today.

G-17

MILCOR STEEL COMPANY

MILWAUKEE, WISCONSIN — CANTON, OHIO

Chicago, Ill. — Kansas City, Mo. — La Crosse, Wis.